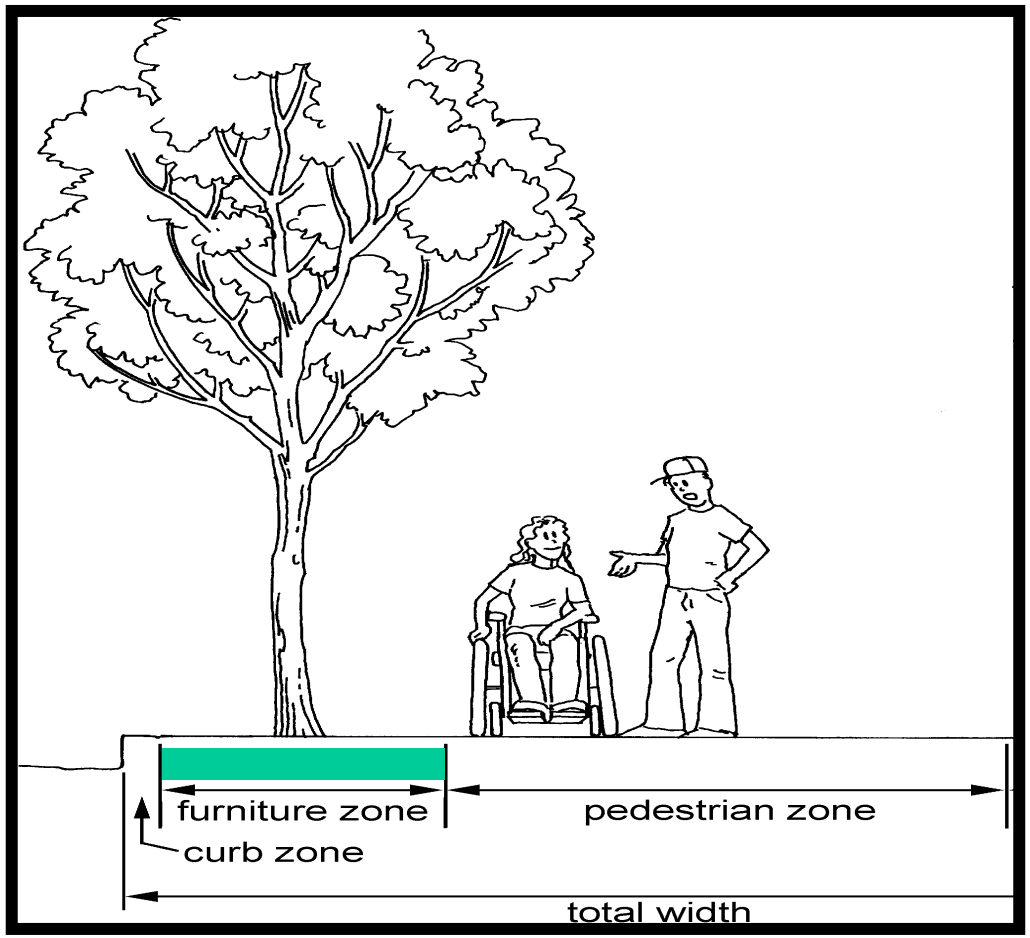
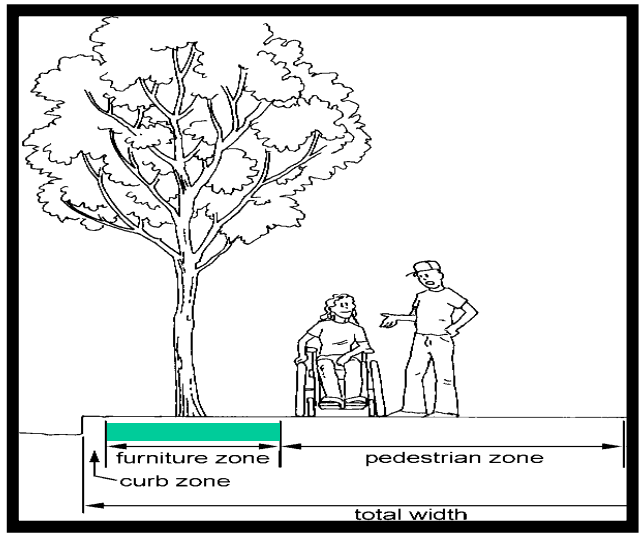
Furniture Zone



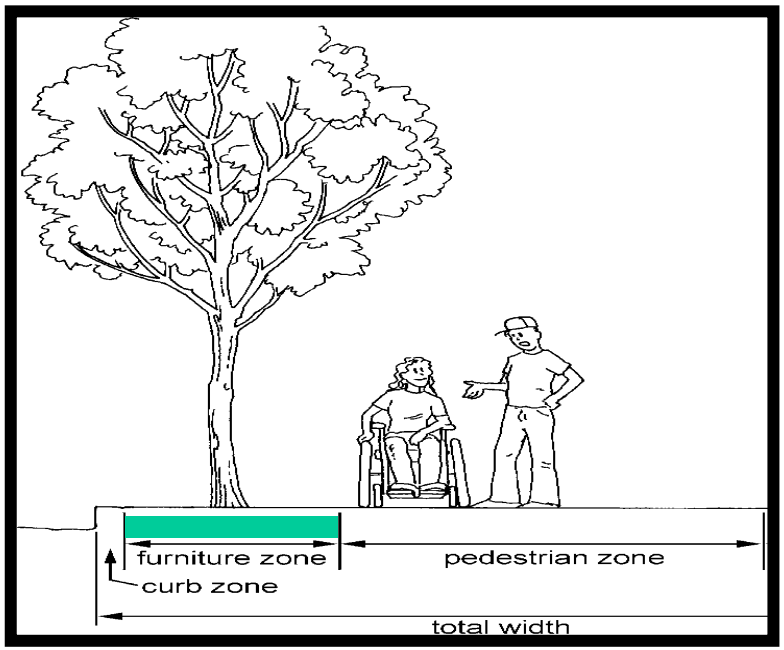
Positioned between curb and pedestrian zones

Furniture Zone



- Ensures pedestrian zone is free of obstacles
- Contains:
  - Fire hydrants and utility poles
  - Pedestrian amenities such as benches, bus shelters, driveway aprons, sign supports, and vending machines

Furniture Zone



- Minimum width is 24 inches (610mm)
- Serves as a buffer between roadway and pedestrian zone

Furniture Zone

Sectioned-Off Street Cafe

Furniture Zone

36 inches (915mm) recommended in areas of on-street parallel parking so that car doors may be opened without obstructing pedestrian zone

Greater width may be required for trees (to grow and spread roots - minimum 48 inches)

Greater width may be required for plowed snow accumulation

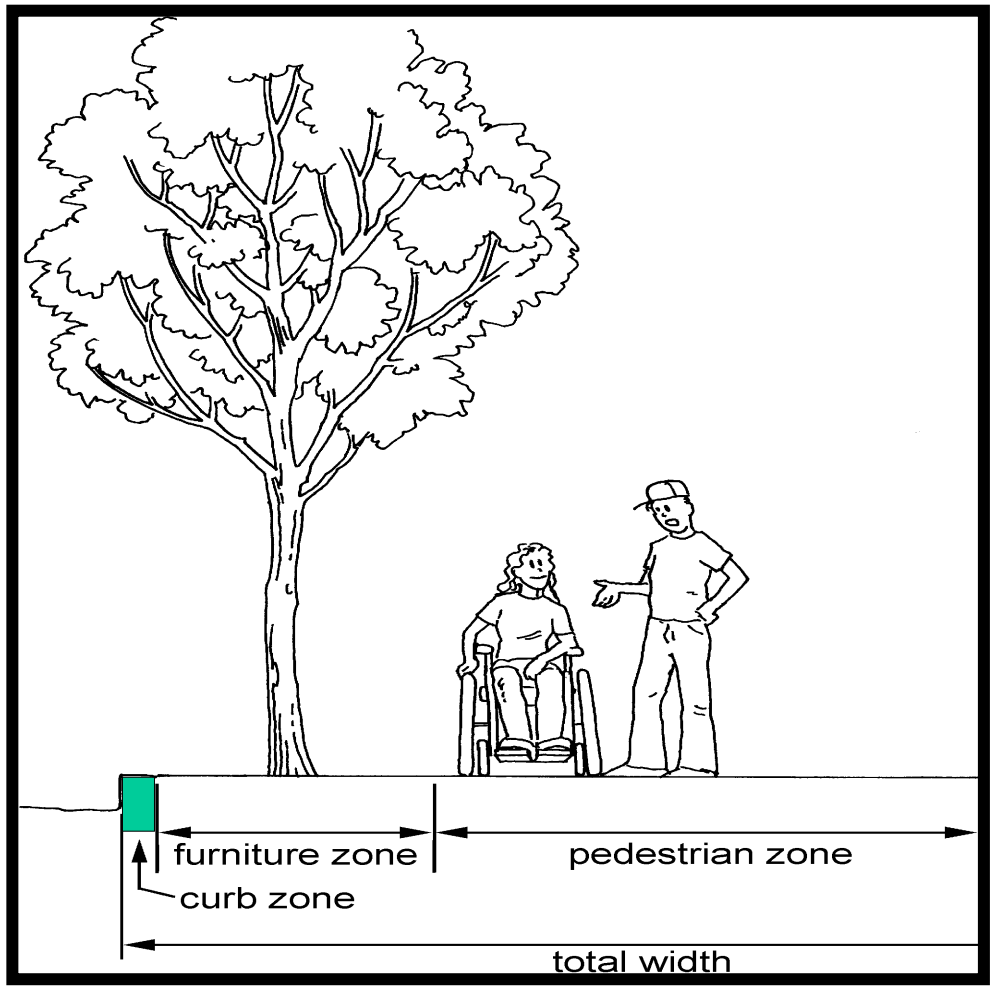
Bus Pads and Shelters

Greater width for bus pads and shelters

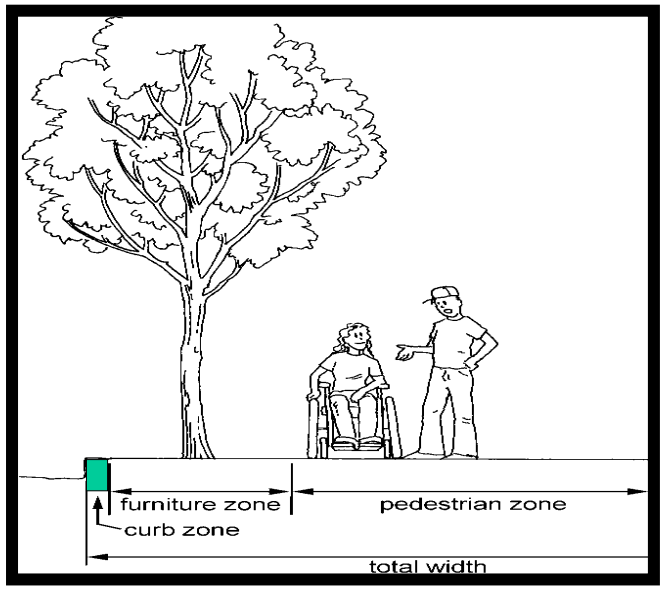
Bus Pads and Shelters

It is important that highway and transit agencies work together to provide adequate space and design

Curb Zone

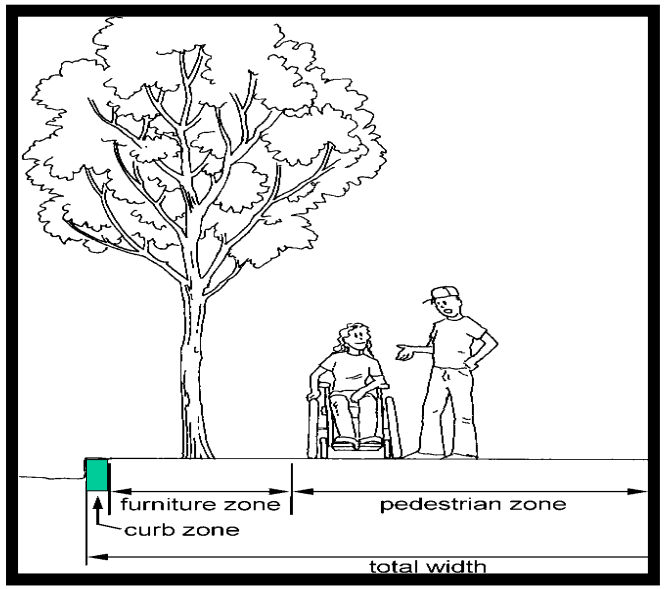


Curb Zone



- Minimum width 6 inches (152mm)
- Integral to the drainage system and prevents excess water from collecting in the sidewalk corridor

Curb Zone



- Discourages motor vehicles from driving onto the sidewalk
- Is a valuable cue used by people with vision impairments

Curb Ramps

Curb Ramps

- First required by the Rehabilitation Act of 1973, Section 504
- The implementing regulations under Title II of the ADA specifically require curb ramps for existing facilities, as well as for all new construction

Curb Ramps

ADA installation priorities for existing facilities:

- Access to government facilities
- Transportation facilities
- Public accommodations
- Places of employment

Curb Ramps

To be included at all transitions:

- Transition from on-street parking
- Loading zones
- Bus stops
- Mid-block crossings
- Roundabouts
- Shared-use paths
- Sidewalks

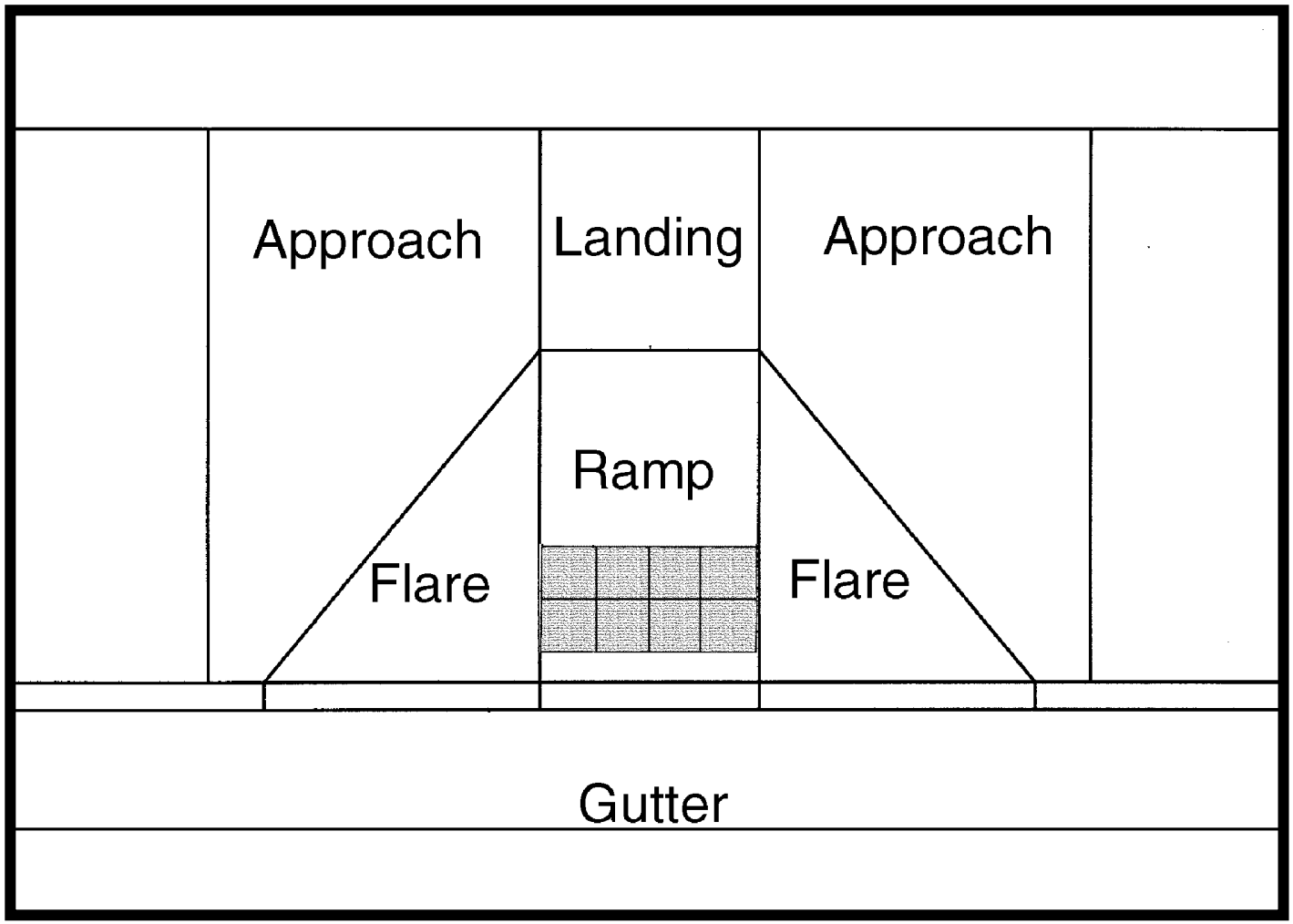
Curb Ramp Benefits and Drawbacks

- Curb ramps provide access for people who use wheelchairs
- However the lack of a curb can create major information barriers for people with vision impairments who rely on the curb

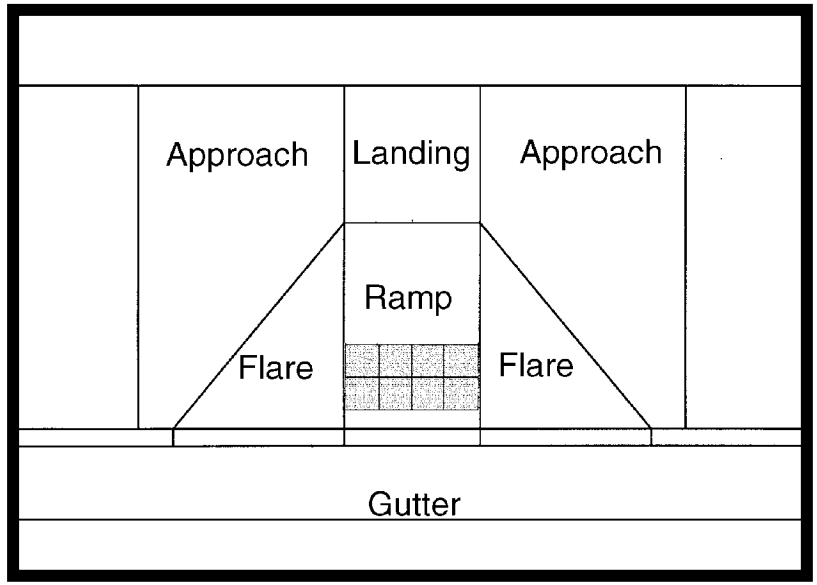
Curb Ramp Benefits and Drawbacks

Curb ramps have taken away the reliable cue about the street edge, and should be designed to maximize detectability for people with vision impairments

Curb Ramp Components

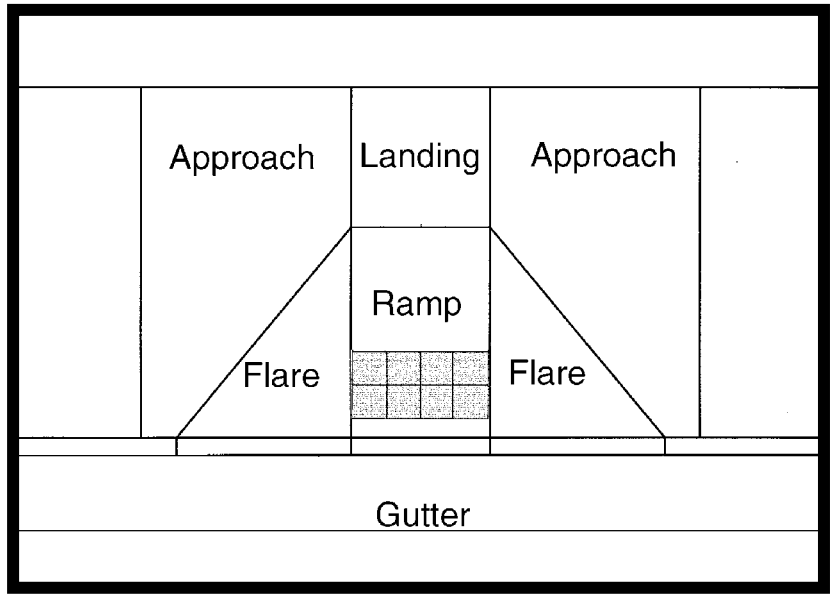


Curb Ramp Design Specifications



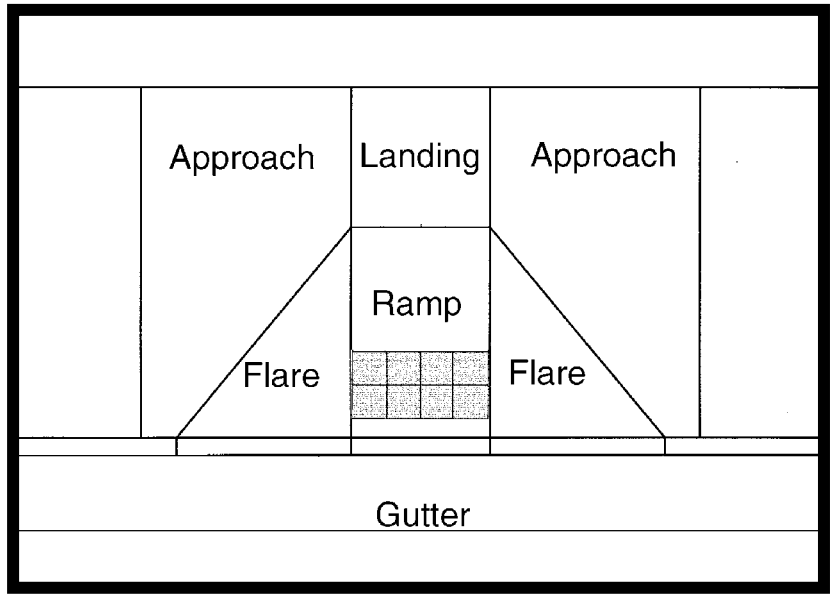
- Placement – approach must be perpendicular to the face of the curb
- Ramp grade - maximum 8.33%
- Length of both sides of the ramp must be equal to minimize warping

Curb Ramp Design Specifications



- Ramp cross slope - maximum 1:48 , 2%
- Gutter slope - counter slope (2%) and cross slope (2%)
- Change in grade 11% (13% maximum)
- Ramp width - minimum 48 inches

Curb Ramp Design Specifications



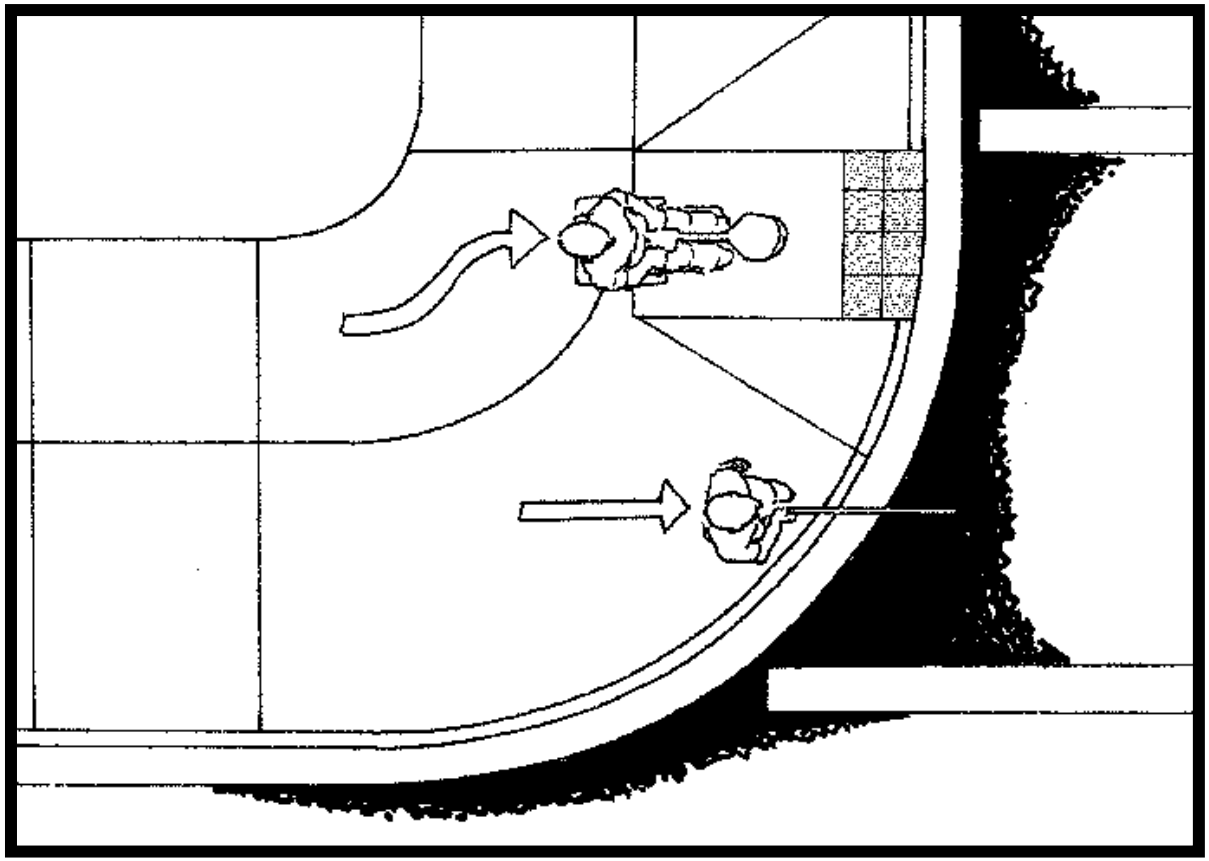
- Top and bottom landing (48 x 48 inches min.)
- Flares or vertical or return curbs
- Changes in level
- Detectable warnings (truncated domes)

Curb Ramp Design Specifications

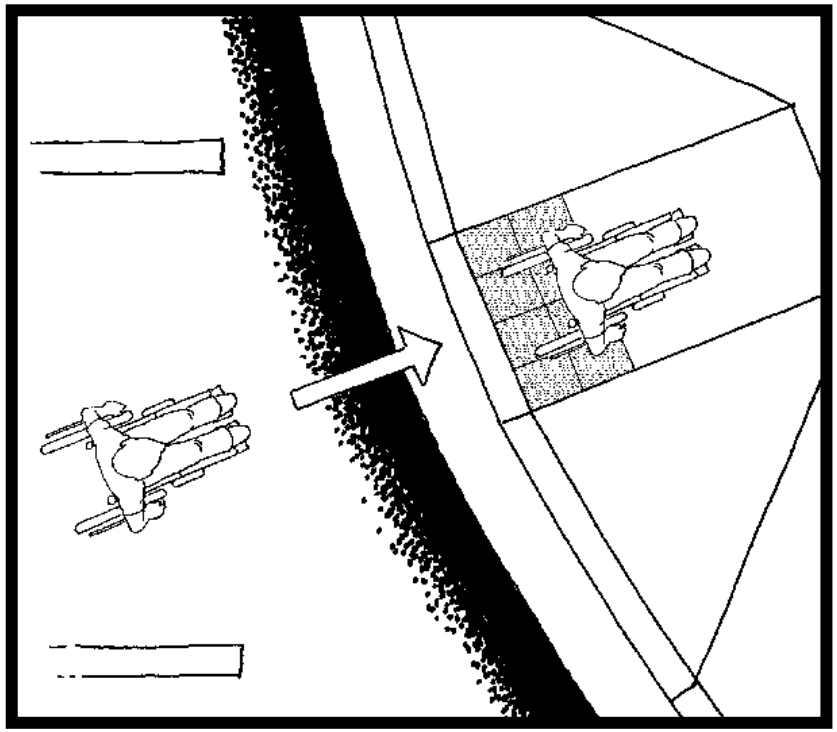
Environment will determine:

- Change of grade combinations
- Returned curbs and flares
- Curb ramp placement at an intersection
- Length of ramp
- Type of ramp installed

Direction of Travel - Ramp Aligned with Crosswalk



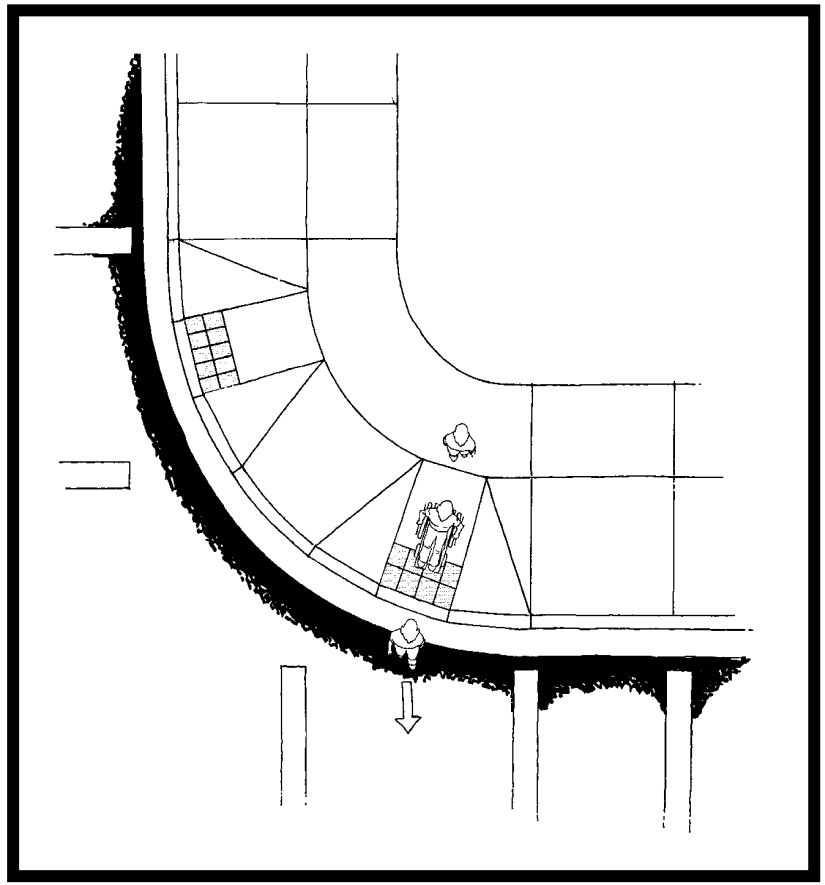
Ramp Approach and Warping



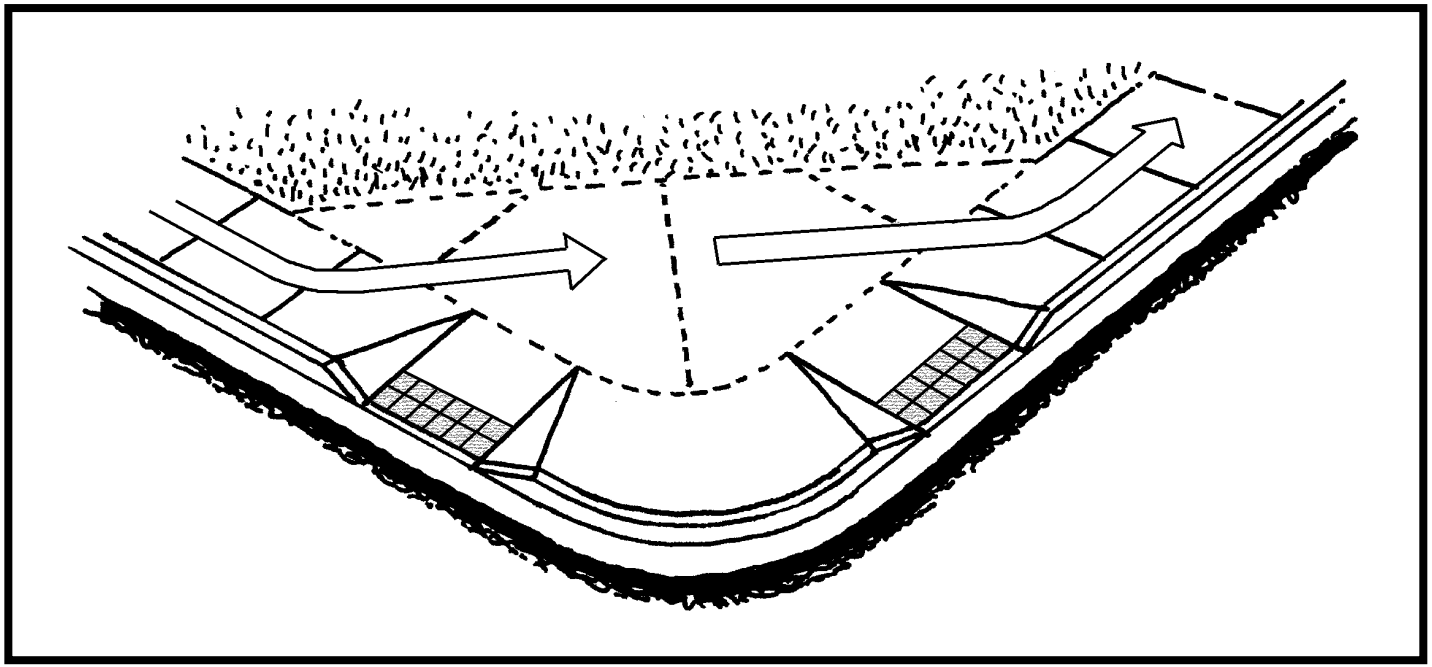
The bottom and top of the curb ramp must be perpendicular to the curb and top landing so the wheels of a wheelchair can stay on the ground at all times

Good Ramp Placement

A pair of perpendicular curb ramps placed in the optimal design for small to medium curb radii



Good Ramp Placement



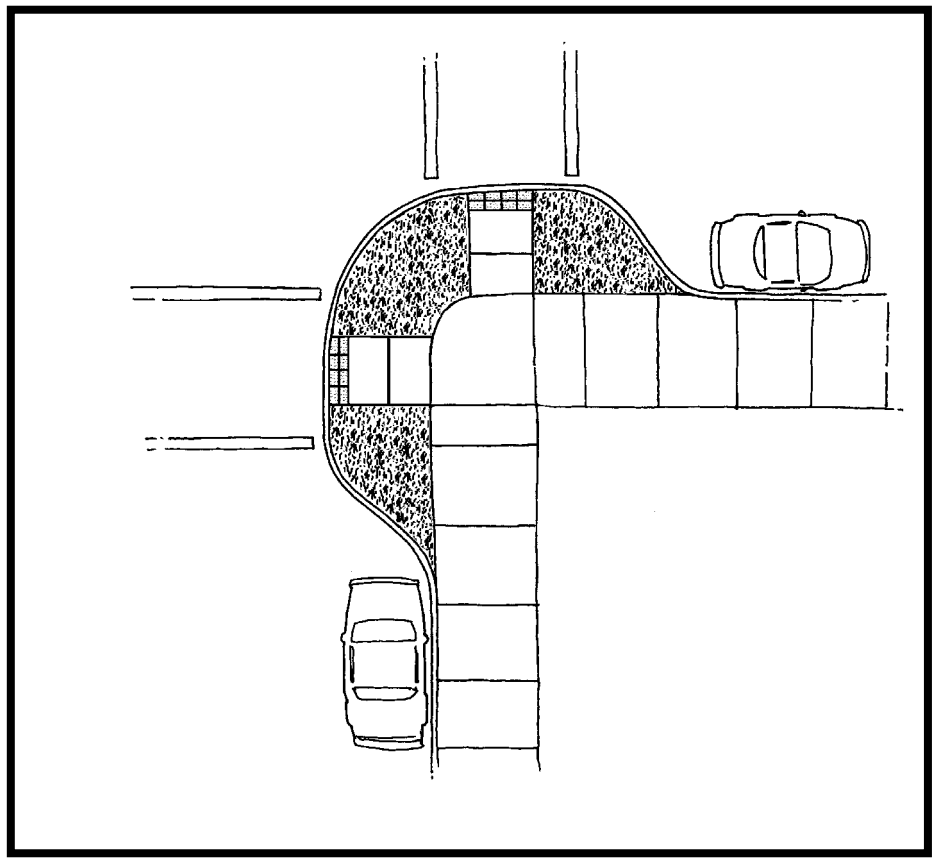
Additional right of way can provide needed access

Poor Curb Ramp Placement at Intersection

Diagonal ramps create a variety of problems because pedestrians using the ramp are directed towards the center of the intersection

Curb Ramp Placement at an Intersection

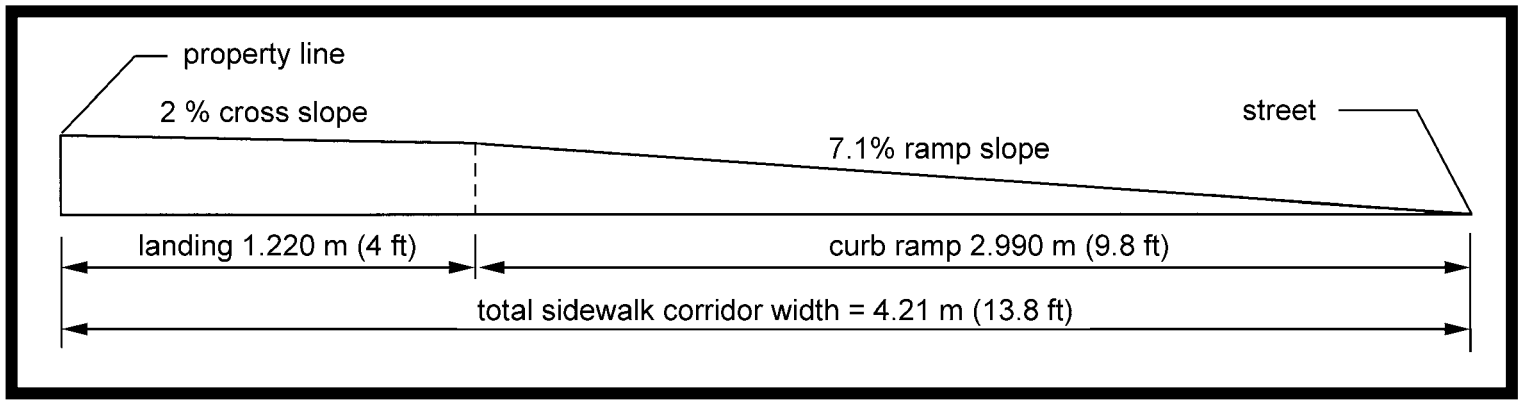
Curb extensions and raised crosswalks are good solutions to limited sidewalk width



Curb Ramp Surfaces

Gratings, access covers, and similar surfaces should not be located on curb ramps, transition ramps, landings, or adjacent gutter pans

Ramp Grade

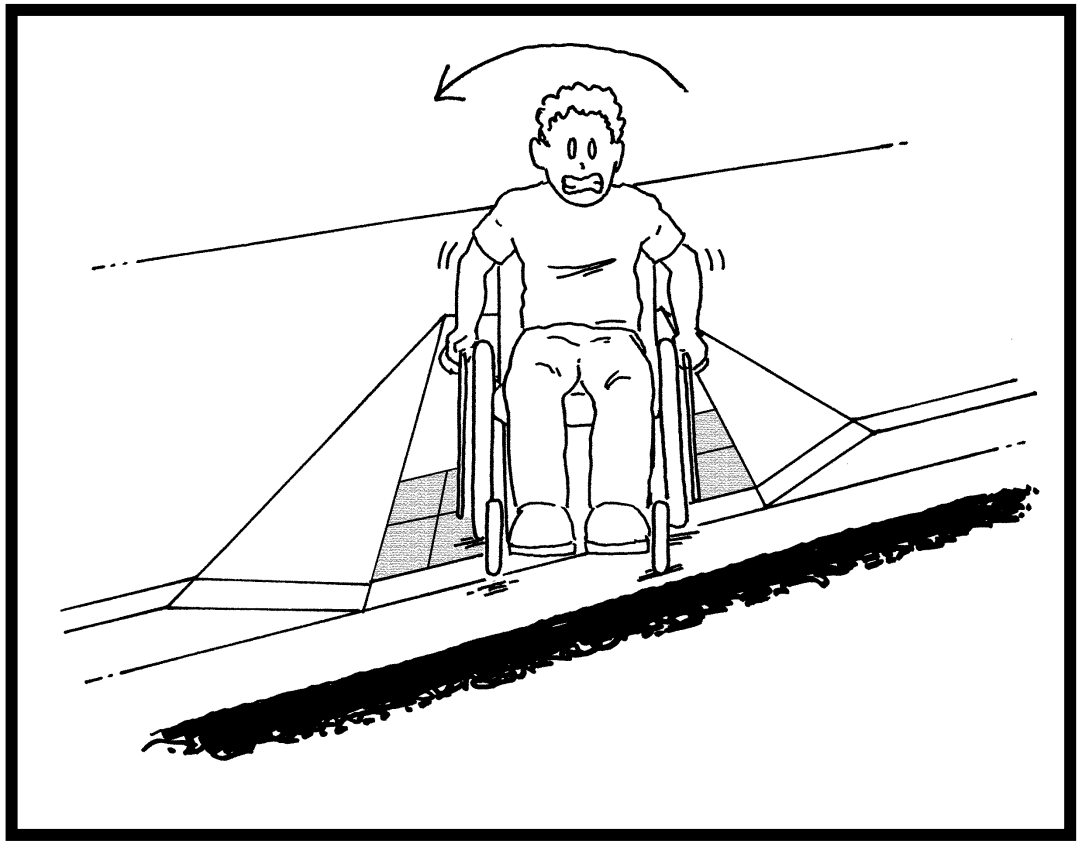


- Maximum 1:12 grade (8.3%) allowed
- Maximum 1:14 grade (7.1%) is recommended to allow a construction tolerance
- Least slope possible is preferred

Ramp Length

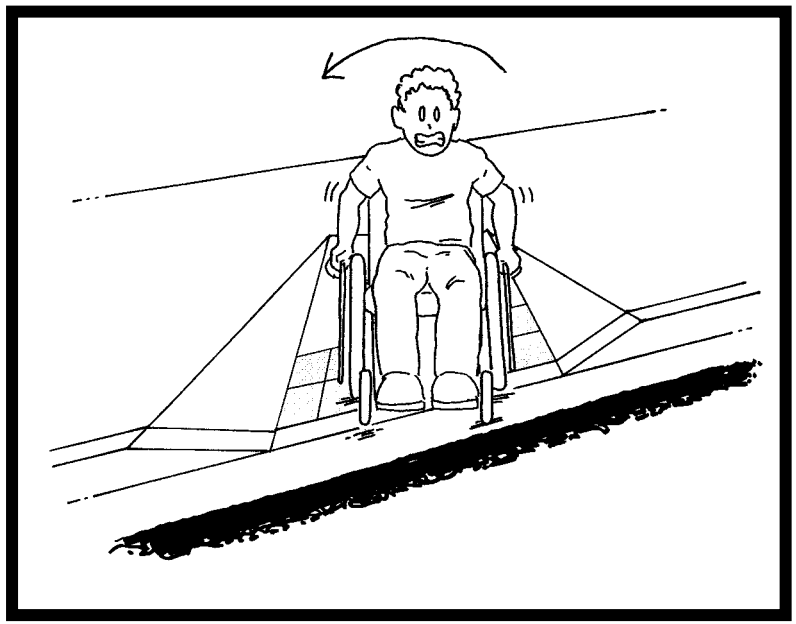
- Ramp length = (curb height x 12) + rise due to cross slope
- The greater the vertical change in elevation, the longer the ramp will have to be in order to meet the recommended grade specification
- Sidewalk area can be gradually sloped down to shorten vertical curb and sidewalk height

Ramp Cross Slope



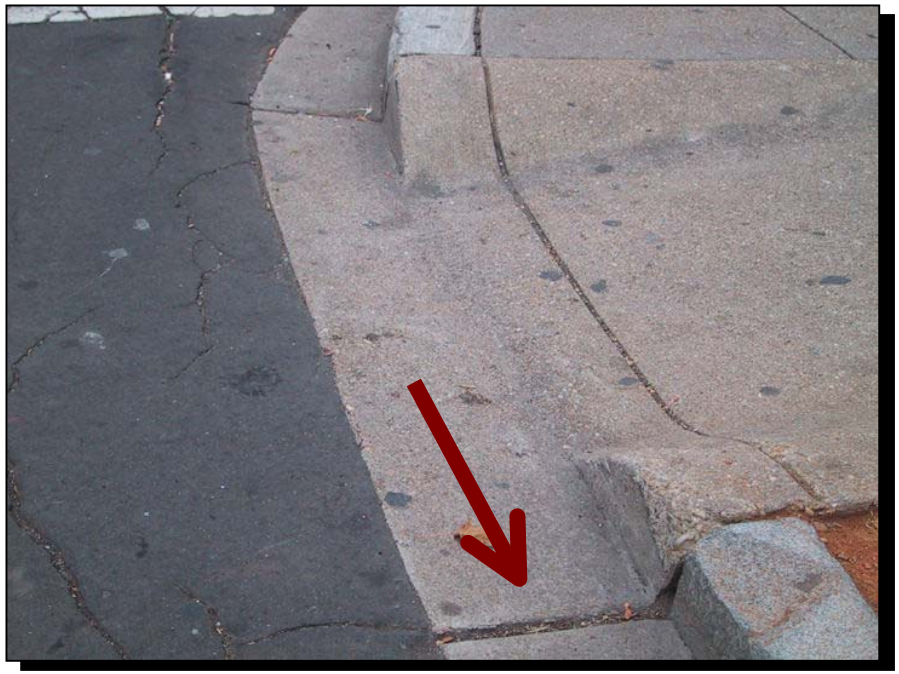
The ramp cross slope should not exceed 2.0 percent (1:48)

Ramp Cross Slope



- People with mobility impairments often have difficulty in negotiating a grade and cross slope simultaneously
- Since the grade of the ramp will be significant, the cross slope should be minimized

Gutter Slope

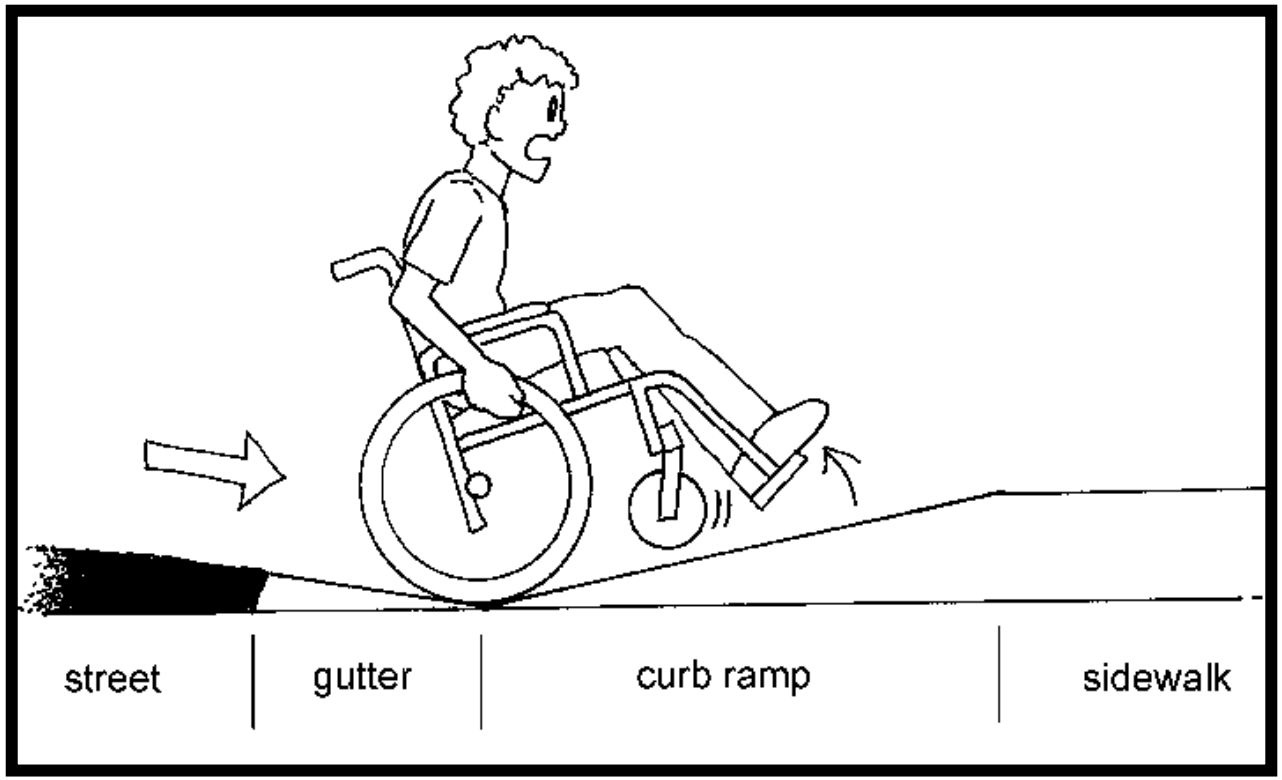


- Definition: Parallel to the curb and the roadway
- Is a cross slope for the pedestrian
- Slope should not exceed 1:48 (2%) at the curb ramp

Gutter Counter Slope

- Definition: Slope opposite the ramp grade
- Is the running grade for the pedestrian
- Slope should not exceed 1:20 (5%) at the curb ramp

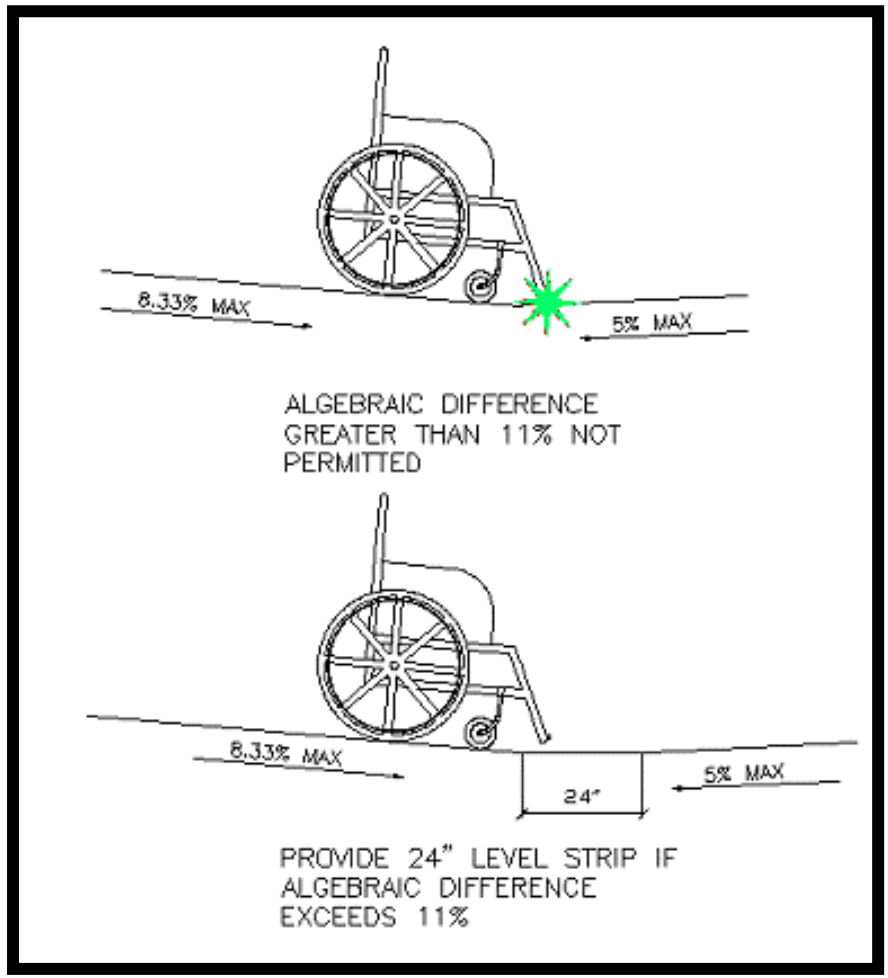
Change of Grade



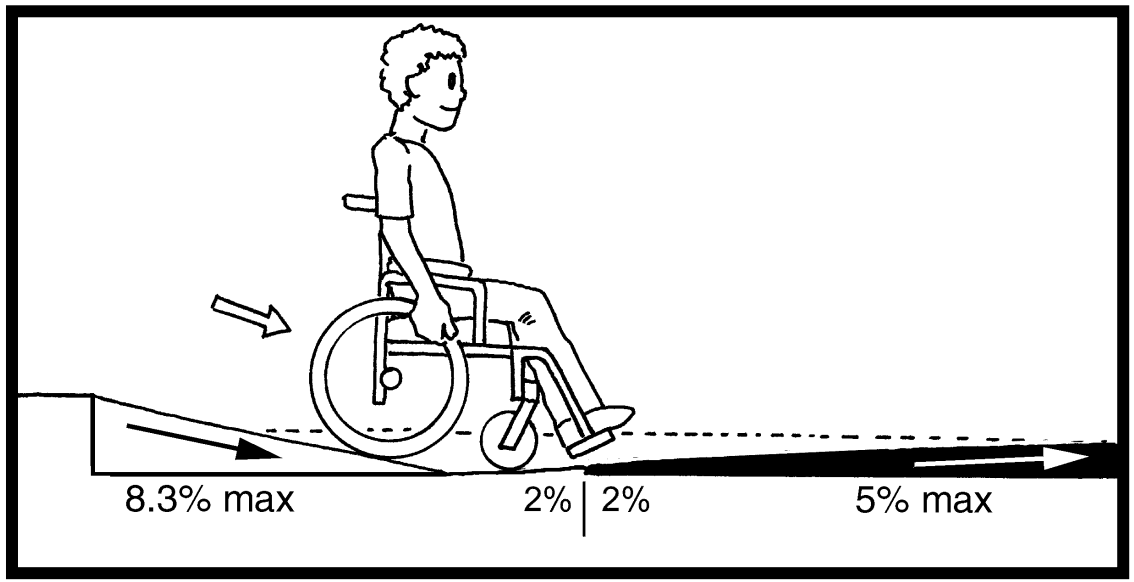
Abrupt changes of grade are difficult for wheelchairs to maneuver and can cause wheelchairs to flip over

Counter Grade Change

Provide foot rest clearance where gutter and curb ramp create a counter grade change



Change of Grade (11% example)



Change of grade needs to be gradual and less than 11 percent (13% maximum)

- Add opposing grades
- Subtract grades in same direction

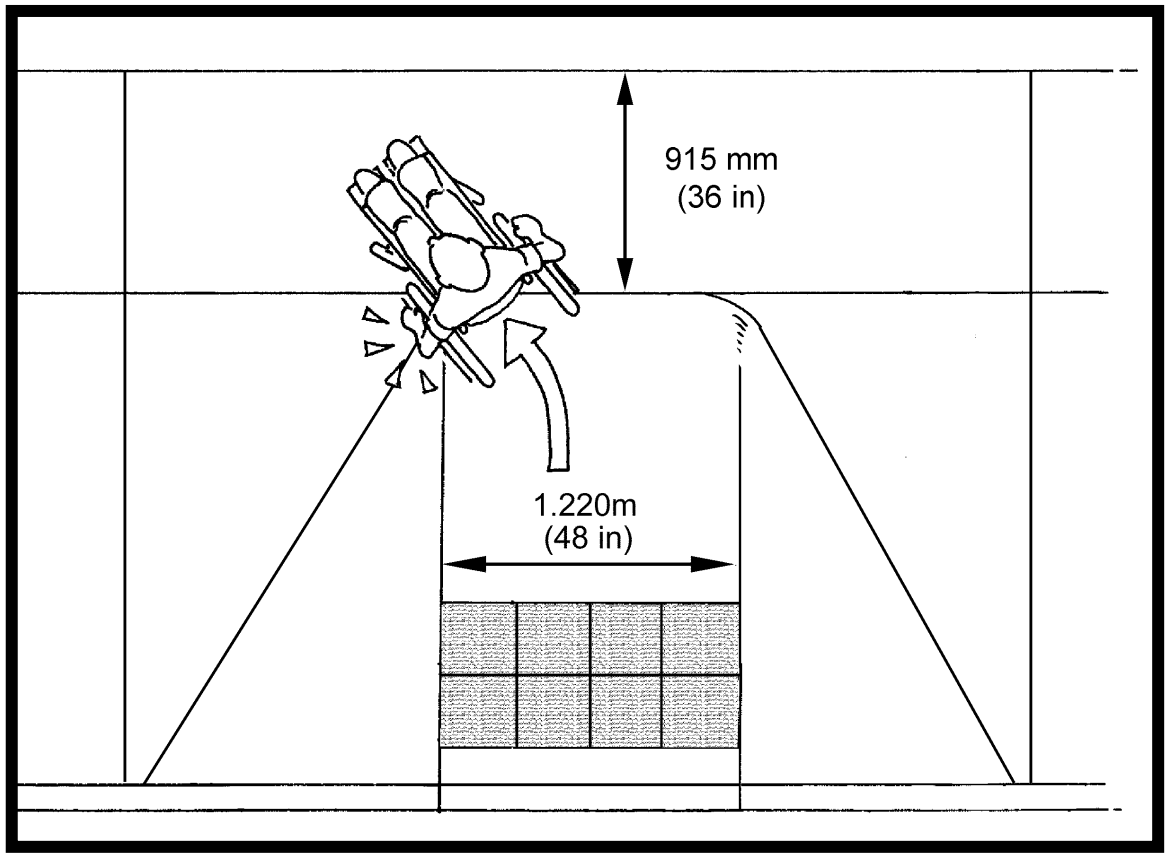
Ramp Width

- Recommended minimum clear width of a curb ramp is 48 inches (1.22m)
- ADAAG minimum width is 36 inches (915mm). This does not provide enough width for walker and crutch users

Landing Dimension and Slope

- Landings may serve multiple ramps or overlap with other landings
- 48 x 48 inches is the ADAAG requirement
- Landings are preferred to be a 60-inch square or 60-inch circle to allow a wheelchair to turn around
- Maximum landing slope is 2.0 percent (1:48) in any direction

Landing Dimension

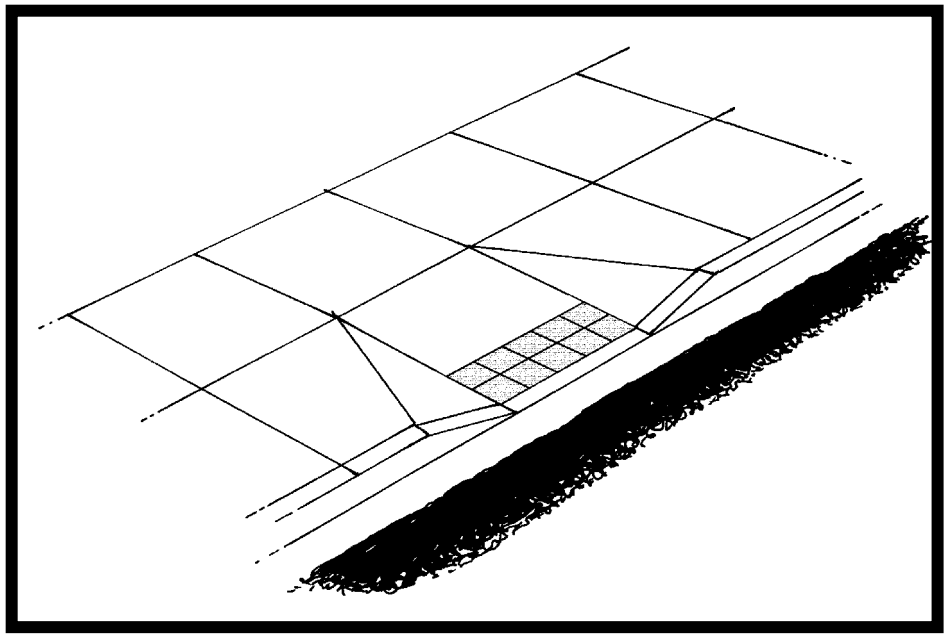


36 inch landing dimension does not provide adequate turning space

Out of Compliance Curb Ramp

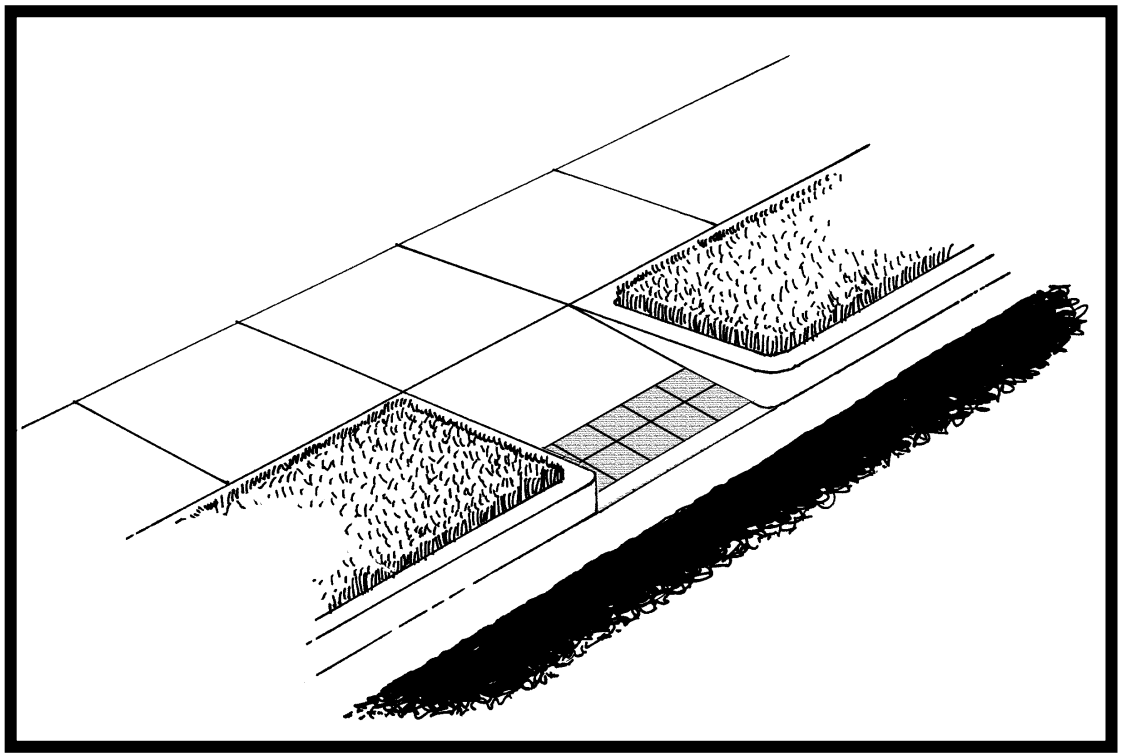
Curb radius is too small for diagonal curb ramp – no 48 x 48 maneuvering space

Flares



- Not part of the access route
- Flares must be used where pedestrians have less than 48 inches width of travel path around ramp
- Flares shall have a slope of 1:10 max. (measured at the face of the curb)

Returned Curbs



Curb ramps located where pedestrians would not travel (furniture zone) may have return curbs

Changes in Level at Adjacent Components

Transition points between curb ramp, landing, gutter, and street should be flush

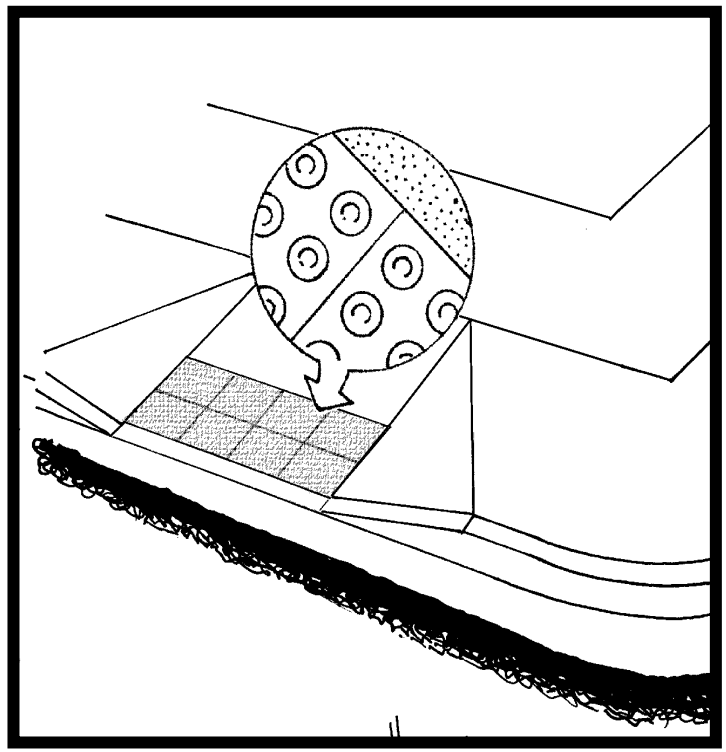
Changes in Level at Adjacent Components

Transition points between curb ramp, landing, gutter, and street should be flush

- ¼ inch (6.94mm) max
- ½ inch (13mm) beveled max
- Bevel cannot be steeper than 1:2 (45 degrees)

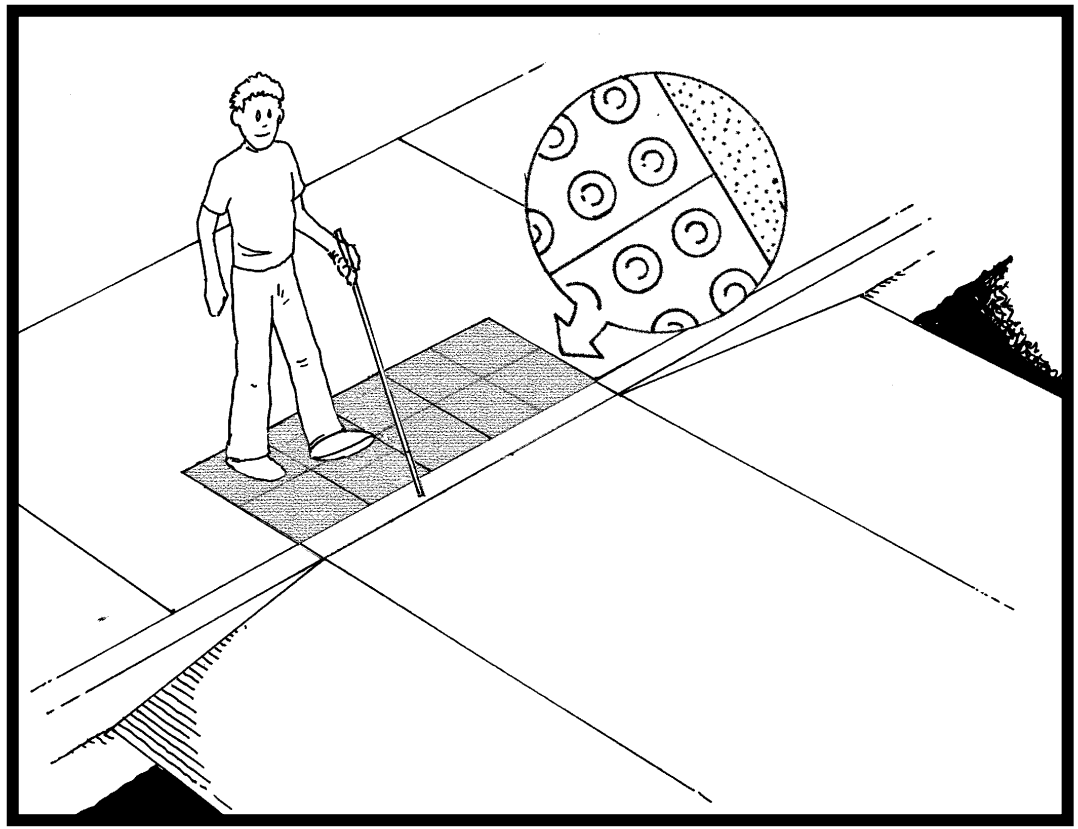
Detectable Warnings

While gradual slopes are desirable for people who use wheelchairs, a detectable warning at the bottom of the curb ramps warns blind pedestrians about sidewalk/street transition.



Low Grade Ramps

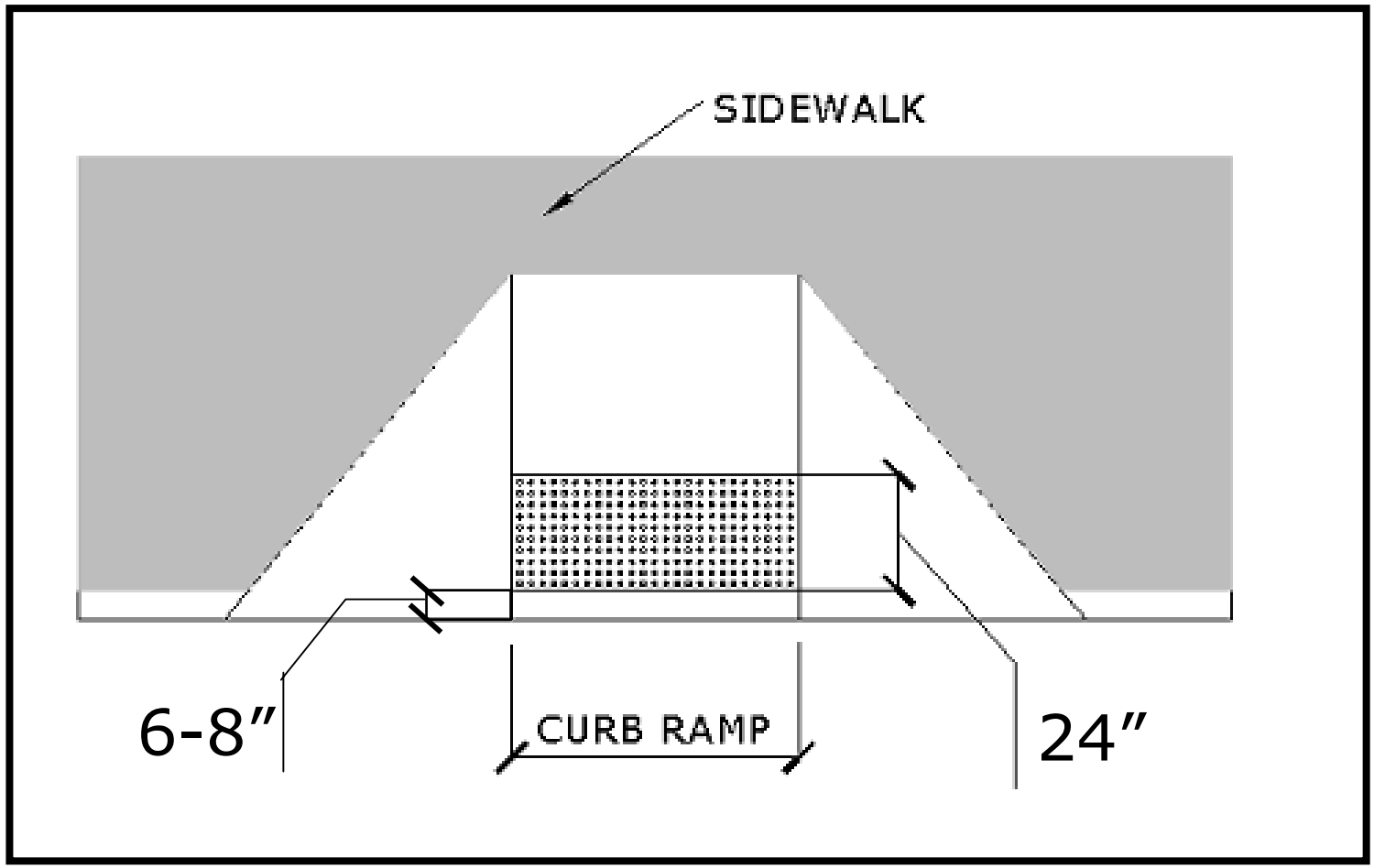
Raised crosswalks and depressed corners can make the street transition undetectable



Detectable Warnings

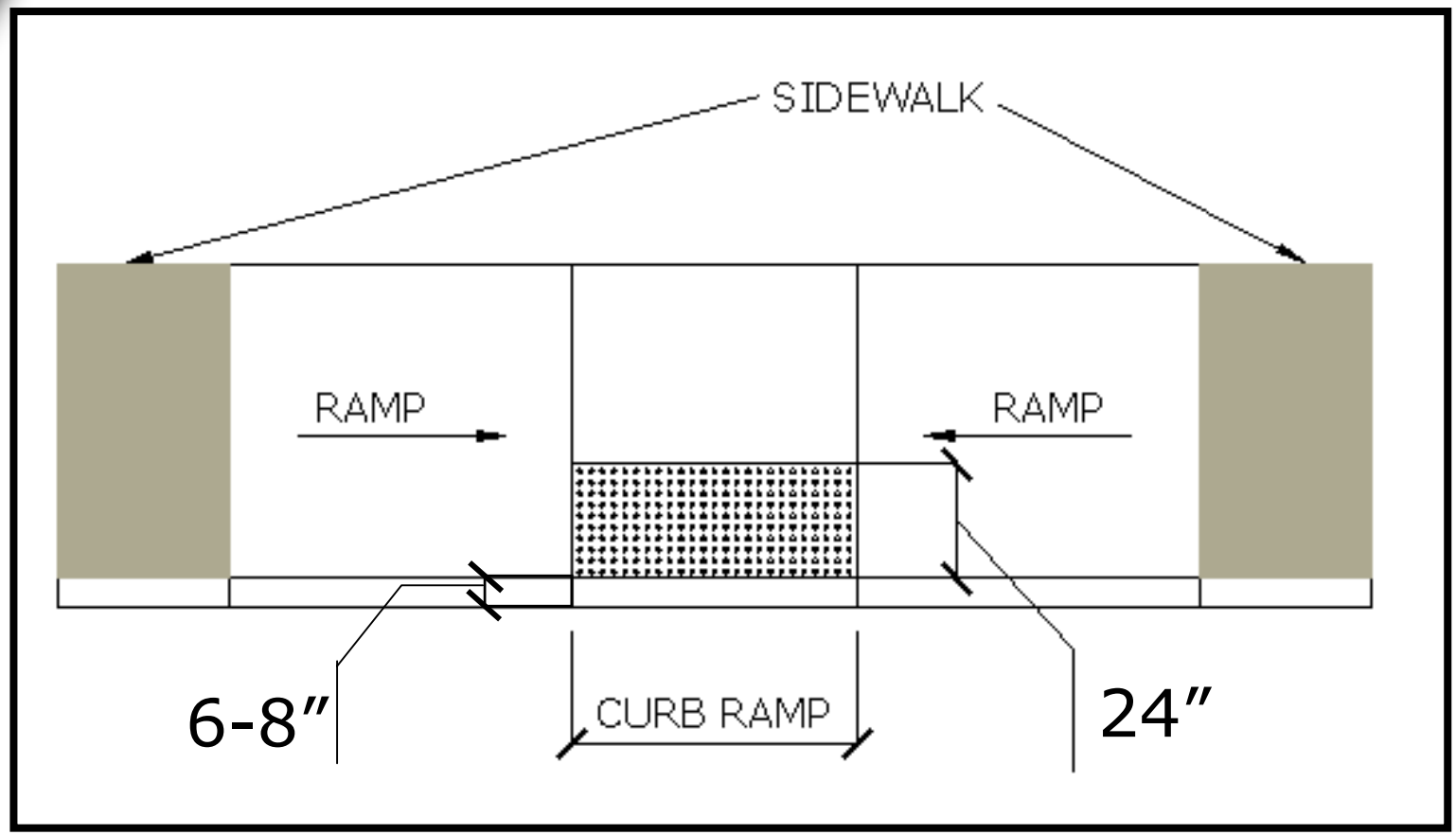
- Required by ADAAG where/at:
  - Curb ramps (4.7.7)
  - Hazardous vehicular areas
    - Medians and islands
    - Rail systems
- Requirement was temporarily suspended - suspension over 7.26.01
- Truncated domes the standard detectable warning

Detectable Warnings Placement



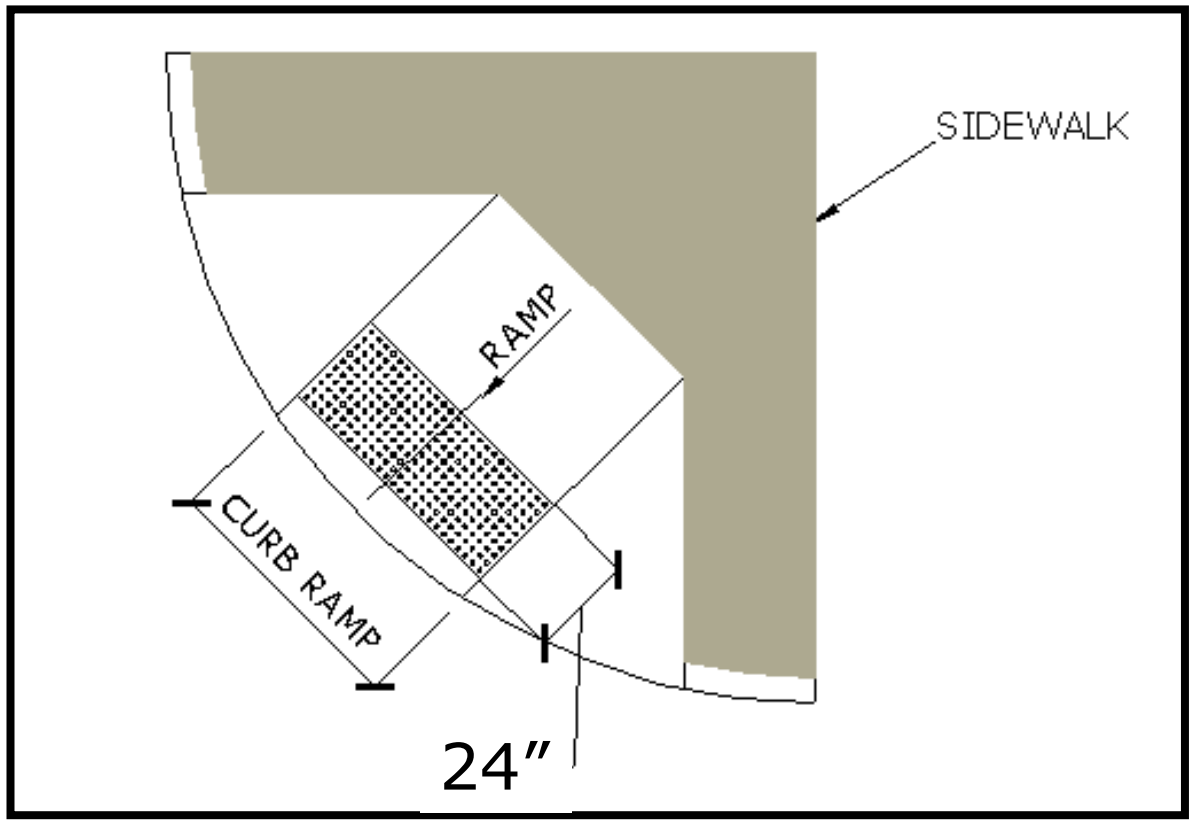
Perpendicular ramp

Detectable Warnings Placement



Parallel ramp

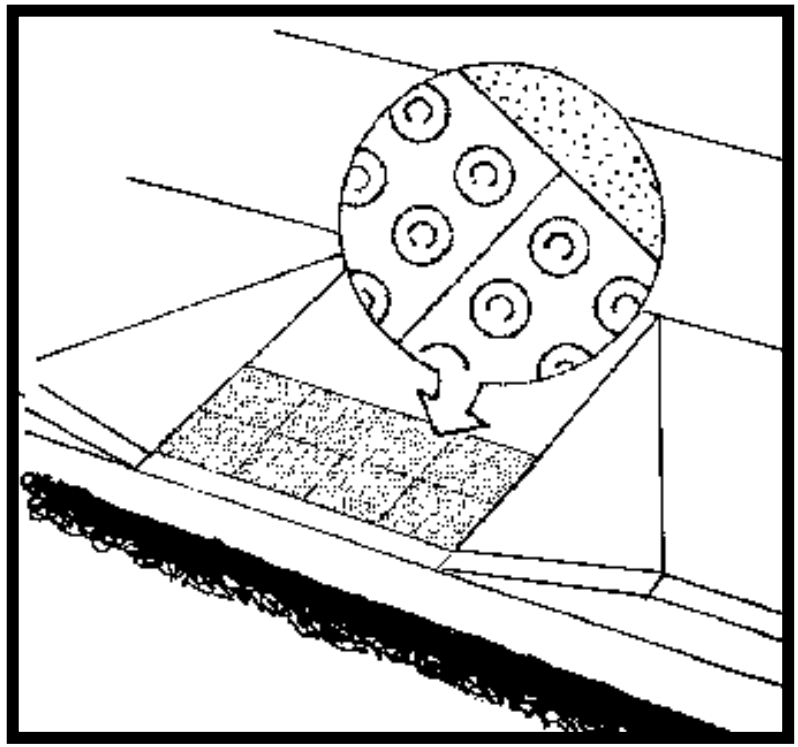
Detectable Warnings Placement



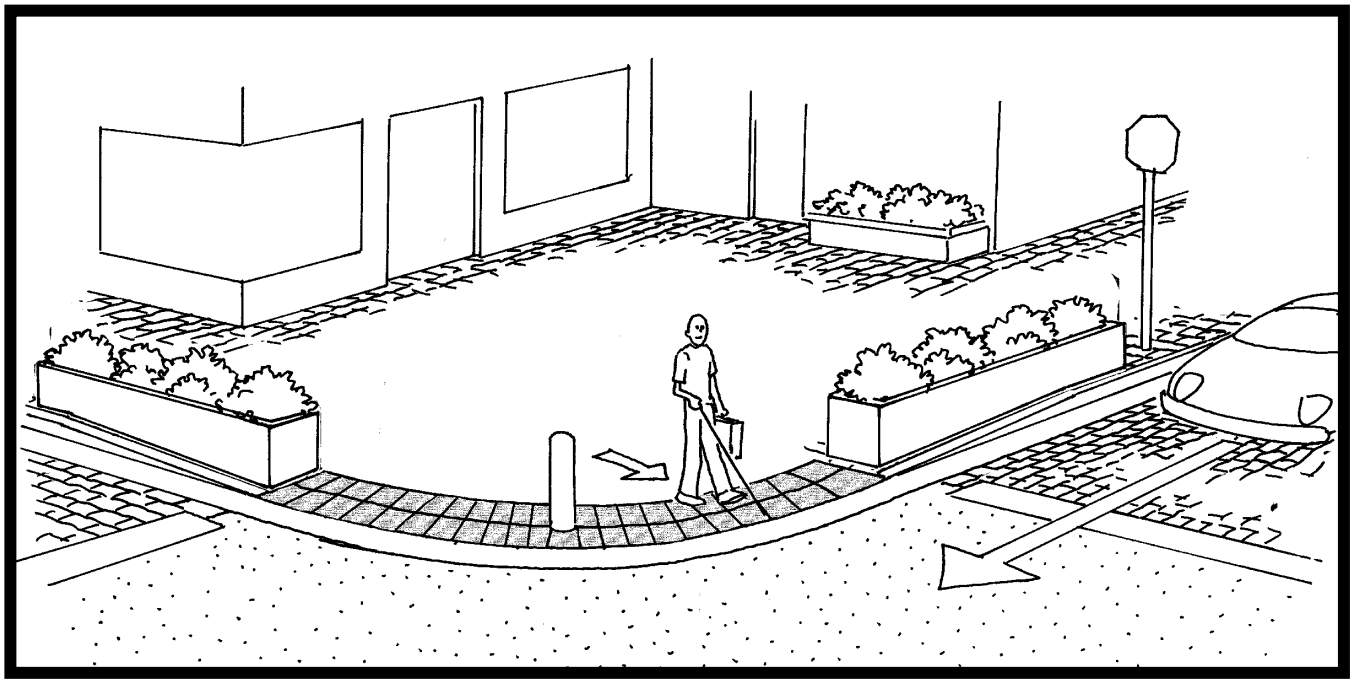
Diagonal ramp

Detectable Warnings

The detectable warning should be placed across all curb ramps 6-8 inches from the bottom of the ramp.

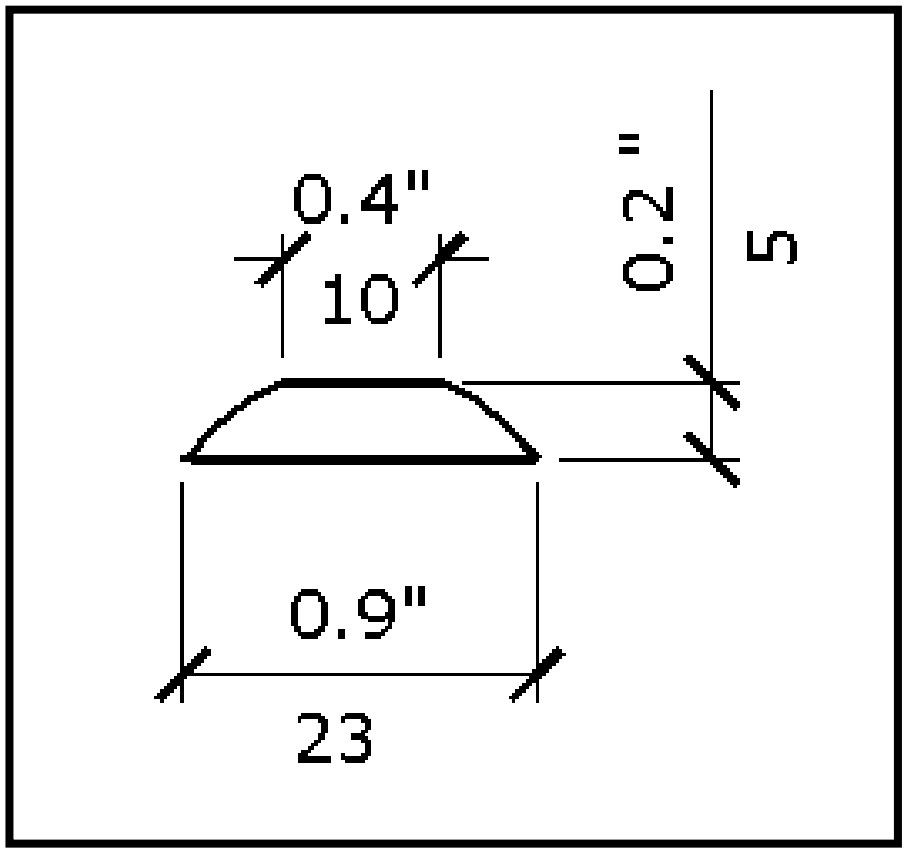


Detectable Warnings

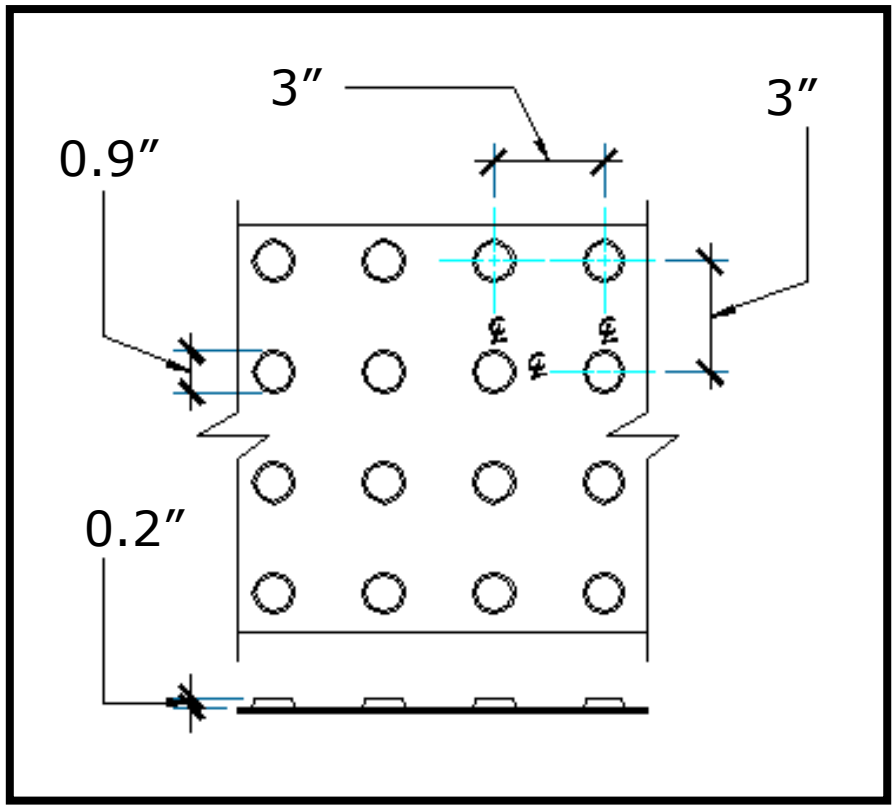


Surrounding surfaces need to be smooth and free of textures for easy detectability of the domes

Design Specifications
Dome Dimensions

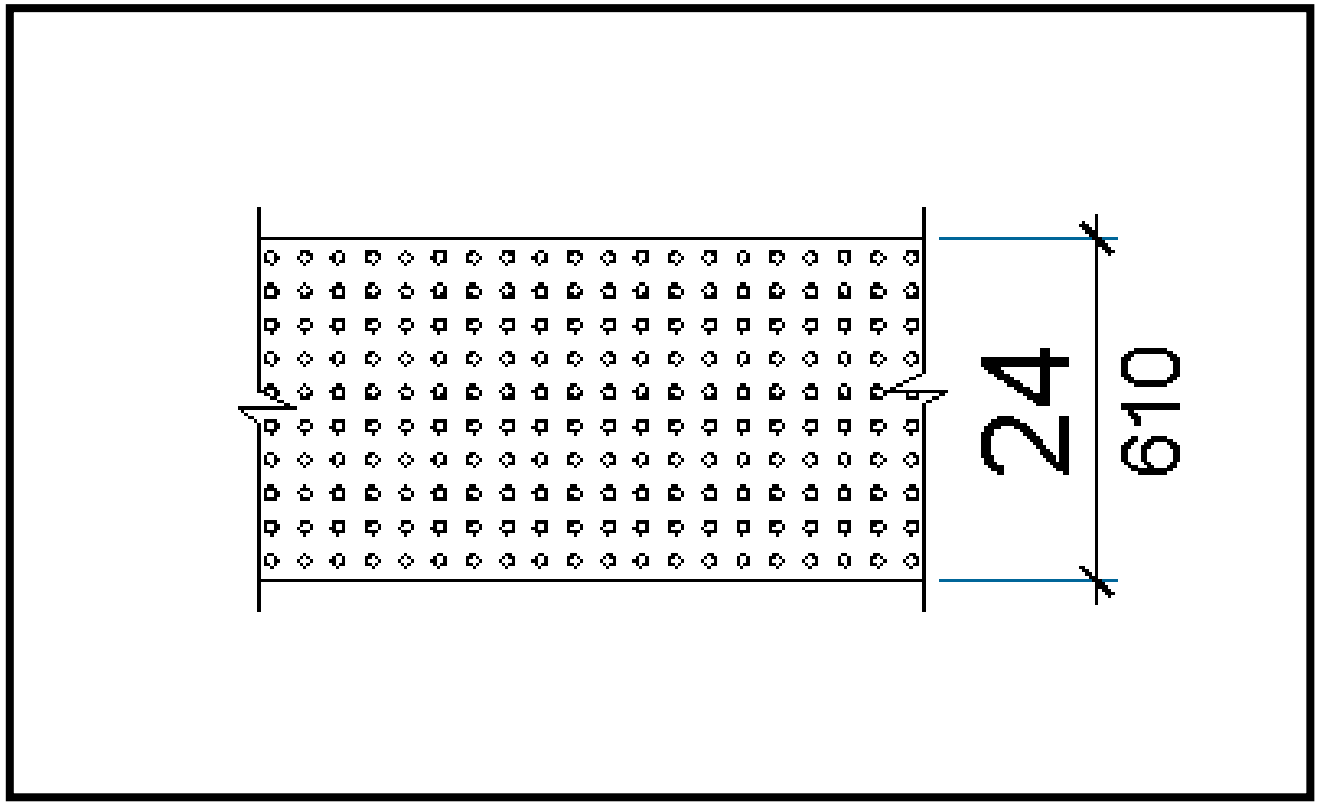


Design Specifications
Dome Spacing



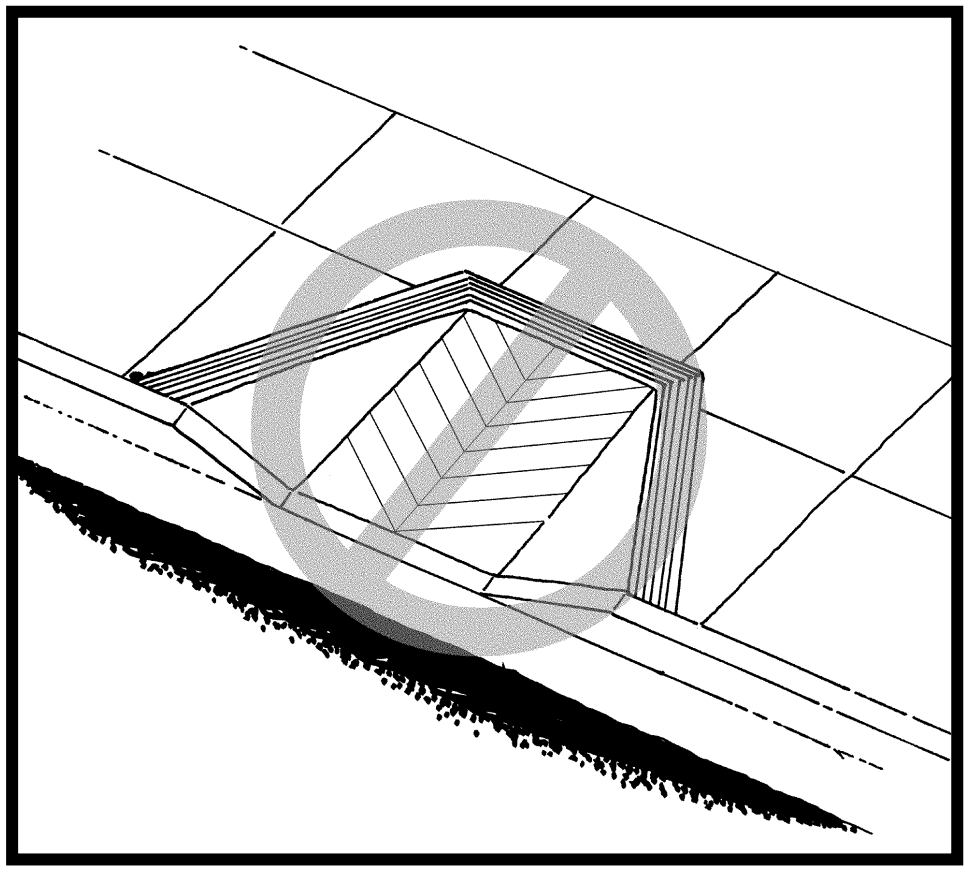
Truncated domes are highly detectable because of unique design

Design Specifications
Dome Alignment

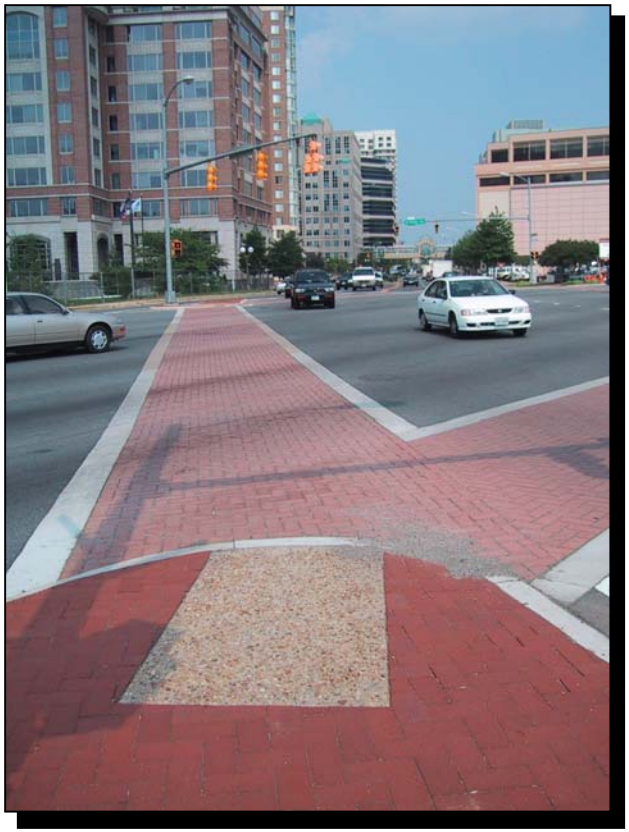


Noncompliant Detectable Warnings

Grooves are not effective: too similar to joints, cracks, and other defects



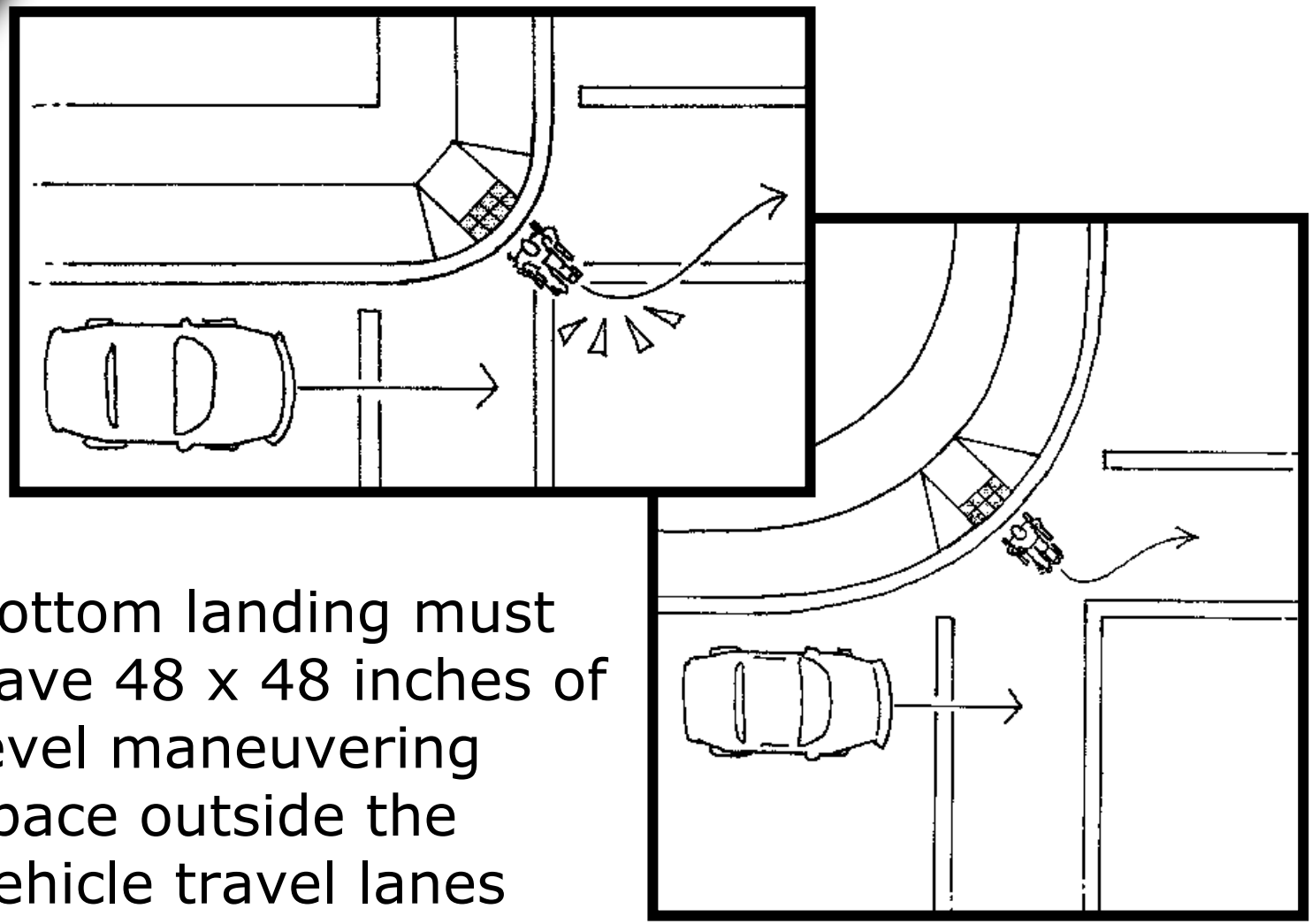
Noncompliant Detectable Warnings



Exposed aggregate is not a compliant surface.

Can you identify other problems here?

Bottom Landing



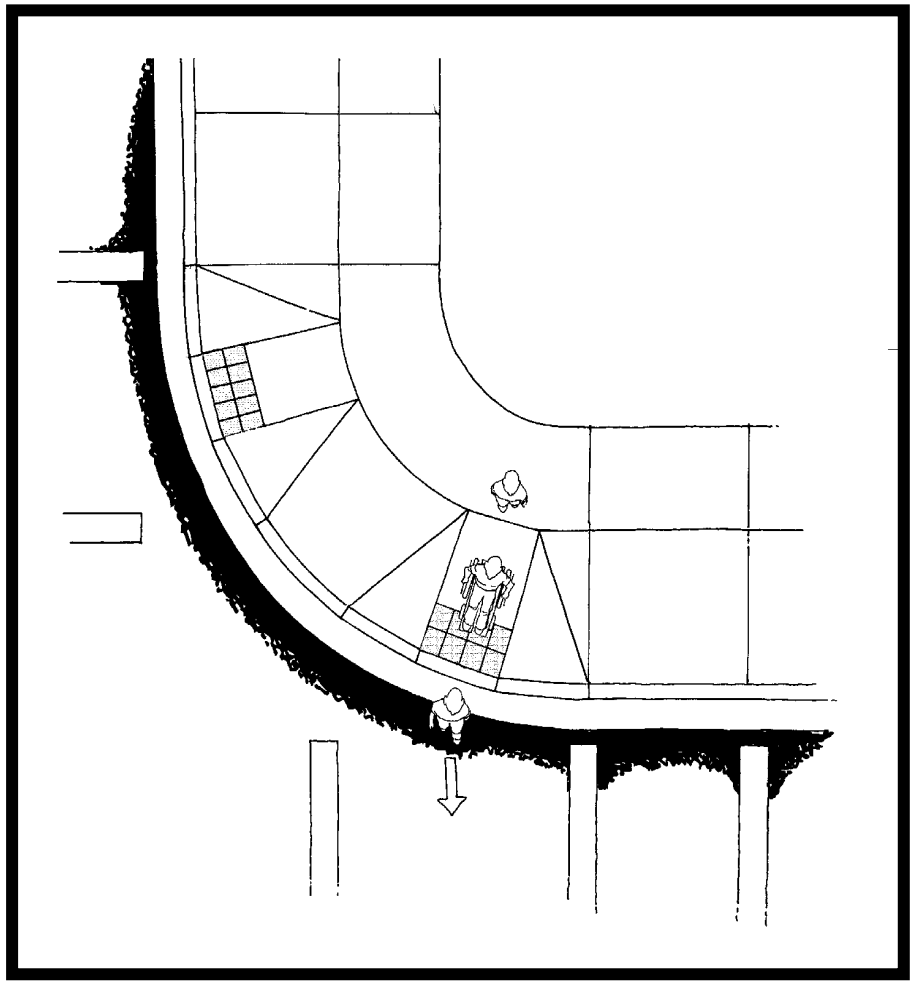
Bottom landing must have 48 x 48 inches of level maneuvering space outside the vehicle travel lanes

Curb Ramp Types

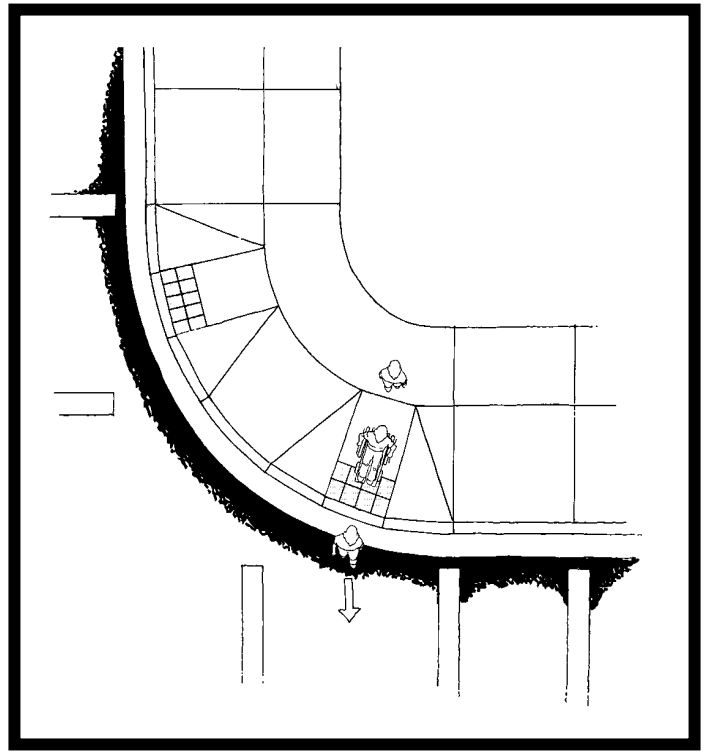
- Categorized by their structural design and position relative to the sidewalk or street
- Types:
  - Perpendicular curb ramps
  - Diagonal curb ramps
  - Parallel curb ramps
  - Combined parallel and perpendicular curb ramp
  - Built-up curb ramps
  - Depressed corners

Perpendicular Curb Ramp

Aligned perpendicular to traffic

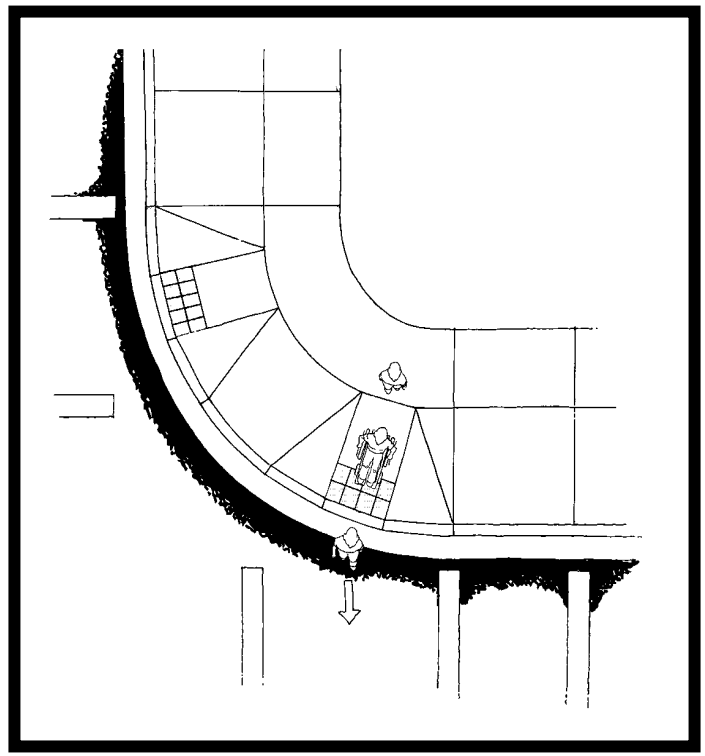


Advantages of Perpendicular Curb Ramps



- Provide a straight path of travel on small and medium radius corners at crossings
- Positioned within crosswalk
- Located at the expected crossing location

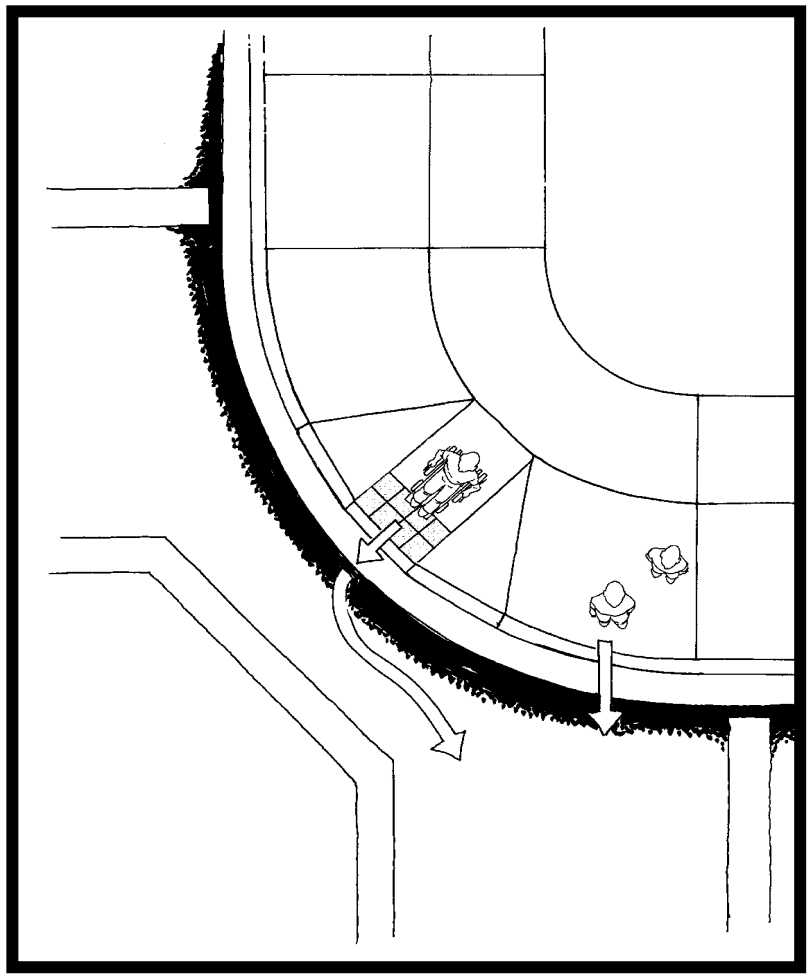
Disadvantages of Perpendicular Curb Ramps



- Difficult to provide a straight path of travel on large radius corners
- A wide sidewalk or curb extension may be needed to accommodate the curb ramp and the level landing

Diagonal Curb Ramp

A single curb ramp that is located at the apex of the corner at an intersection perpendicular to curb

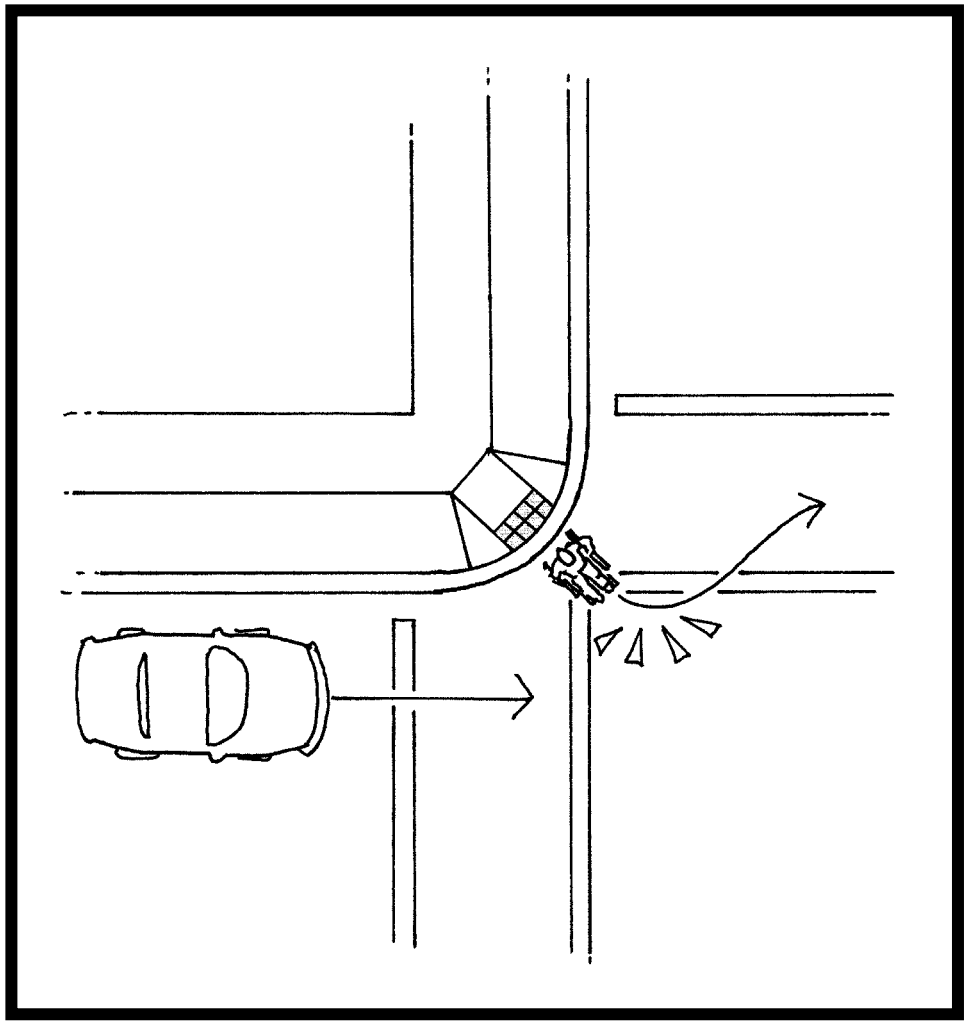


Diagonal Curb Ramp Disadvantage

Curb radius must be large enough to comply with the 48 x 48 inches of level maneuvering space outside the parallel direction of vehicle travel (ADAAG 4.7.10)

Diagonal Curb Ramp Disadvantage

Path of travel will lead into the center of the intersection on small radius corners creating conflicts with motorists

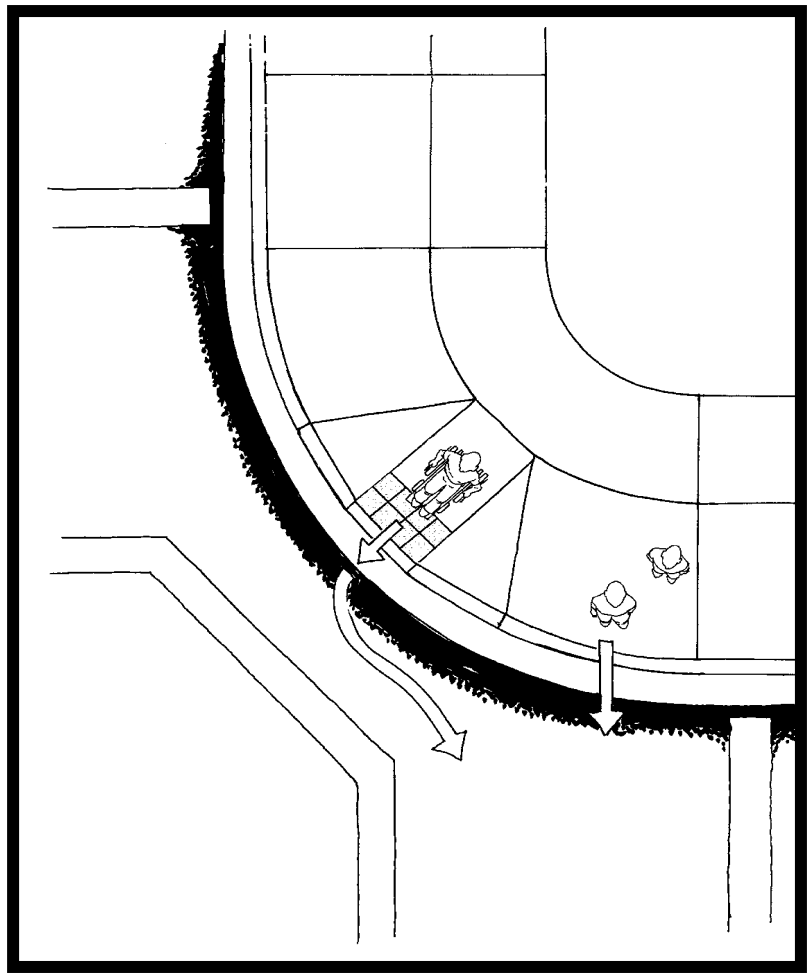


Diagonal Curb Ramp Disadvantage

Creates safety problems for people with using mobility devices

Limited Pedestrian Advantages of Diagonal Curb Ramps

Easier for pedestrians with vision impairments who use the curb (rather than the curb ramp when crossing) to detect the end of sidewalk



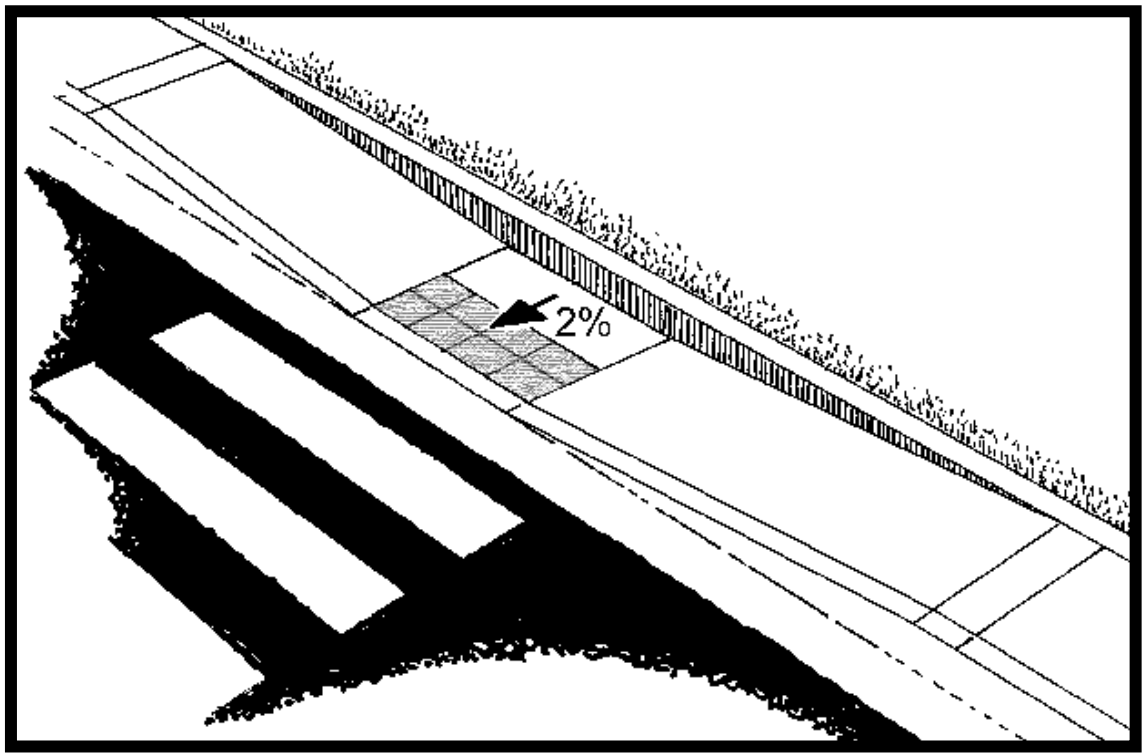
Non-Pedestrian Advantages of Diagonal Curb Ramps

- Requires less space
- Only one curb ramp per corner
- Are less expensive for alterations

Parallel Curb Ramp

Consists of two ramps leading down towards a center level landing with a level landing at the top of each ramp

Parallel Curb Ramp



Oriented so that the path of travel on the ramp is parallel to the adjacent vehicular path of travel

Advantages of Parallel Curb Ramps

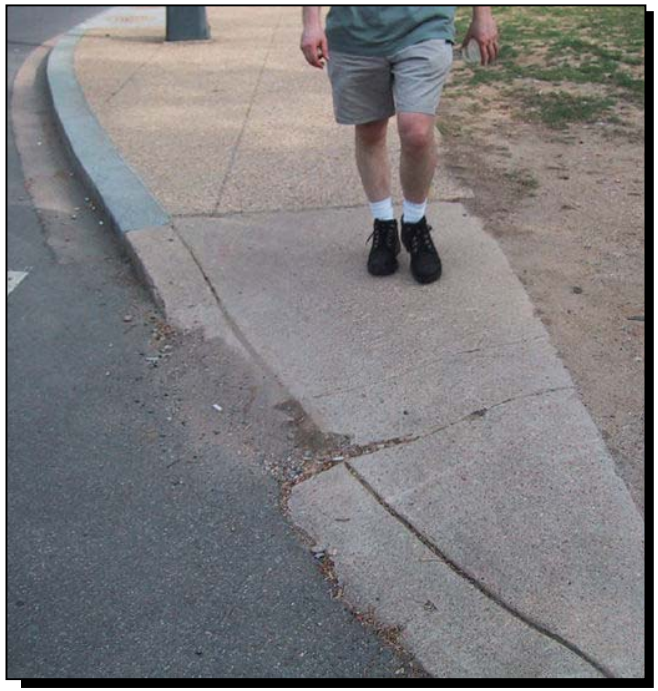
Provides:

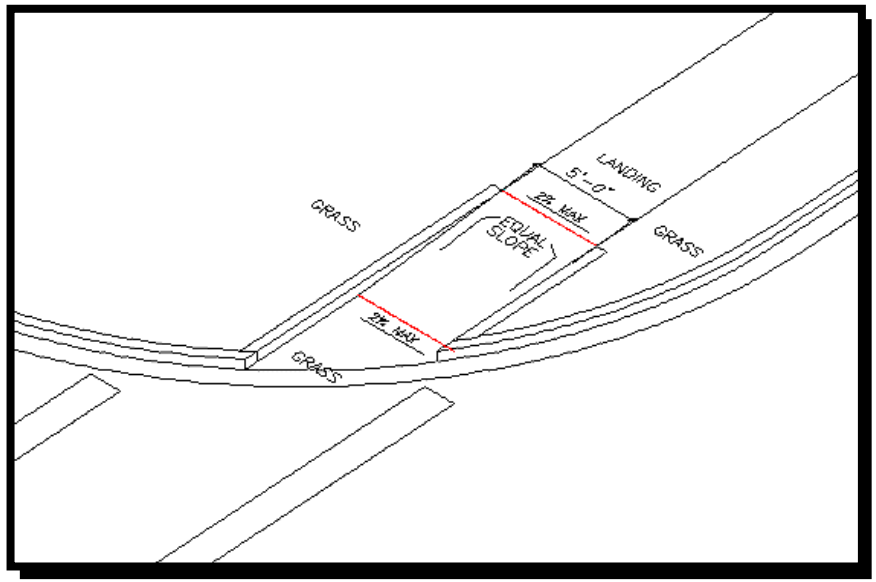
- The connection to the street within the crosswalk
- A level maneuvering area at the bottom and top of the ramp
- Edges on the sides of the ramp that are clearly defined for people with visual impairments
- Limited right-of-way needed

Inaccessible Ramp

Parallel ramp could be a solution to this non-compliant ramp

Possible Solution to Inaccessible Ramp





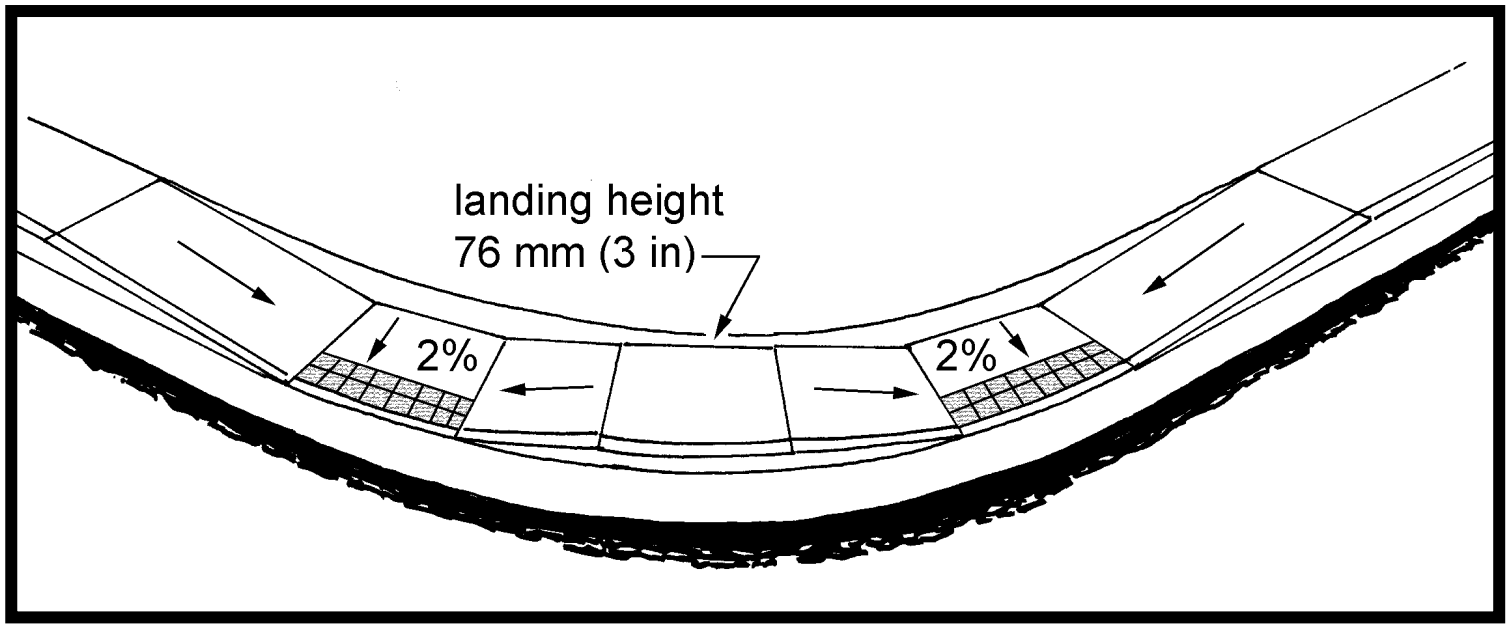
Parallel ramp could be a solution to this non-compliant ramp

Disadvantages of Parallel Curb Ramps

Requires:

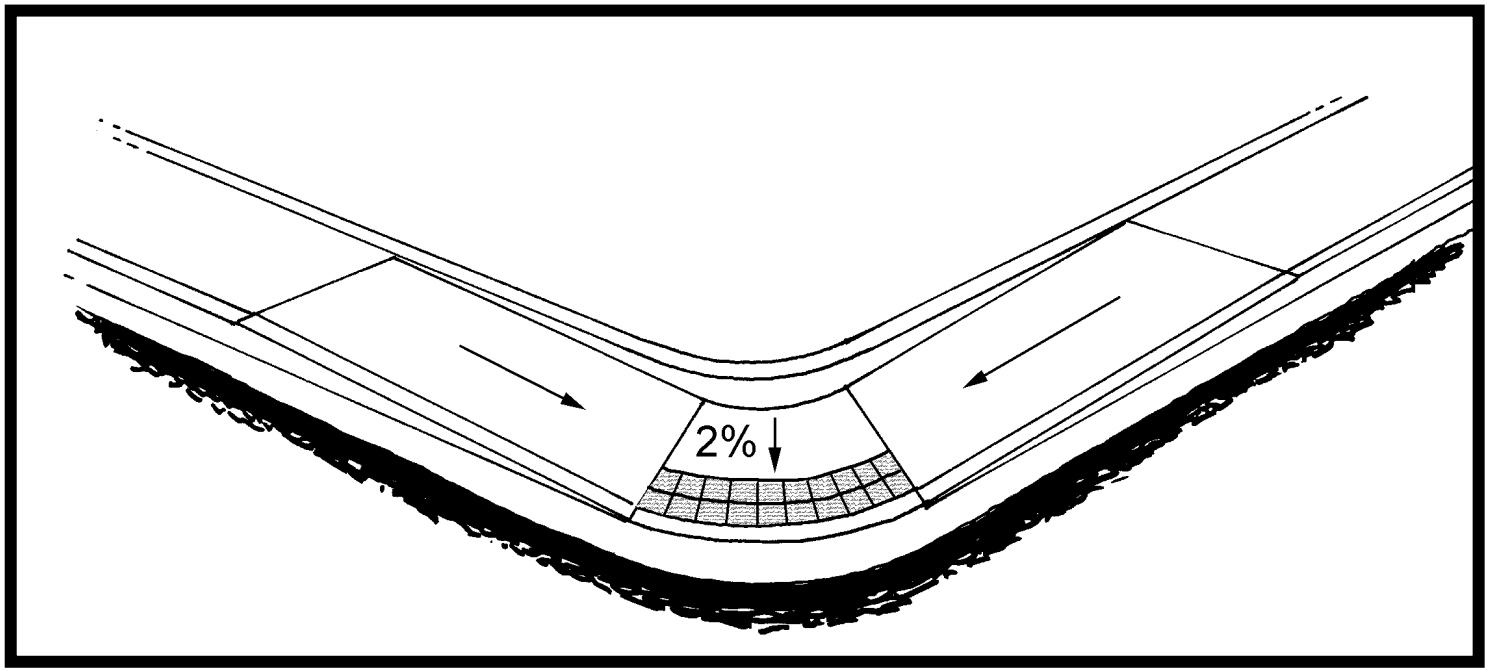
- Users continuing along the sidewalk negotiate ramp grades
- Careful attention must be given to the construction of the center level landing to limit the accumulation of water and/or debris

2 Parallel Curb Ramps



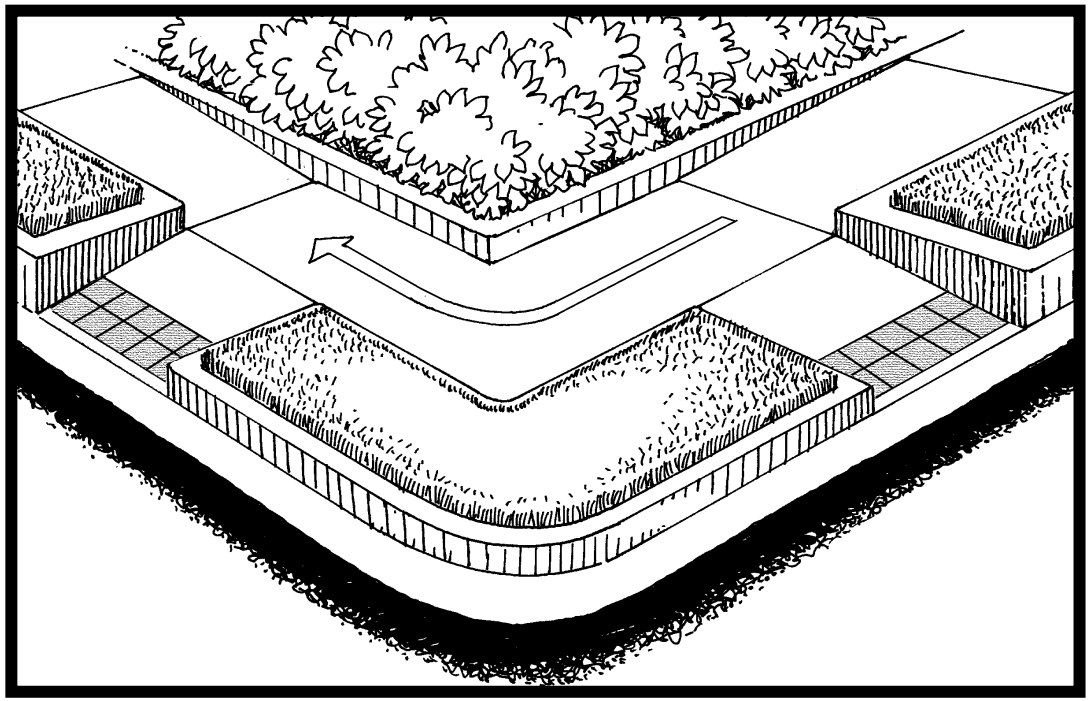
Disadvantage: Travelers staying on the sidewalk must negotiate 4 ramp grades

Single Parallel Curb Ramp



Disadvantage: Travelers crossing are led into the center of the intersection

Combined Parallel and Perpendicular Curb Ramps



- Lowers elevation of landing
- Perpendicular ramps connect landing and the street

Combined Parallel and Perpendicular Curb Ramps

Enhances access where the sidewalk:

- Has a steep grade
- Has a high curb

Advantages of Combined Parallel and Perpendicular Curb Ramps

- Provide the connection to the street within the marked crosswalk
- Are aligned with the crossing direction
- Provide the level maneuvering areas at the top and bottom of the ramps

Disadvantages of Combined Parallel and Perpendicular Curb Ramps

- Generally require more space than a parallel curb ramp
- Require more extensive alterations in retrofit situations
- Require sidewalk users continuing along the sidewalk to negotiate the ramps

Built-up Curb Ramps

Built-up Curb Ramps

- Built-up curb ramps project from the curb into the gutter and street
- Usually oriented in the same direction as perpendicular curb ramps
- Are not commonly installed on sidewalks
- Frequently installed in parking lots

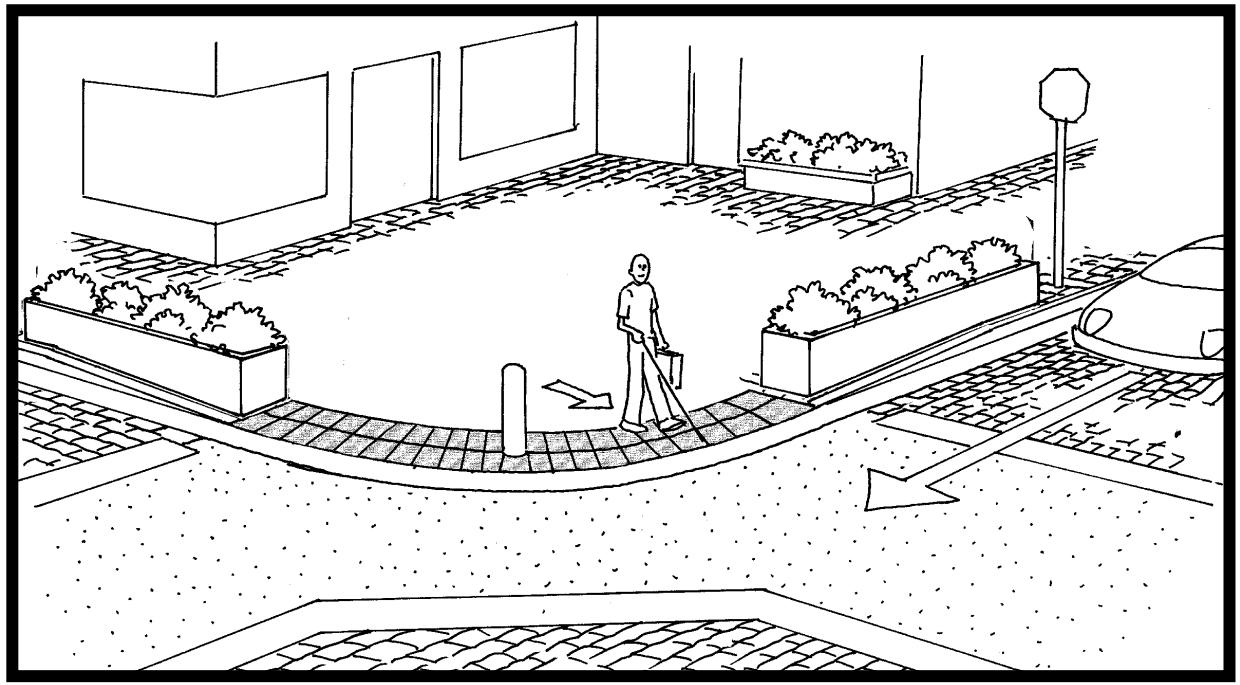
Disadvantages of Built-up Curb Ramps

- Users are more exposed to cars in the roadway
- No clear boundary exists between the ramp and the street
- Adequate drainage may be difficult to achieve or may require more extensive alterations to the gutter and the street
- Edges can be hazardous

Disadvantages of Built-up Curb Ramps

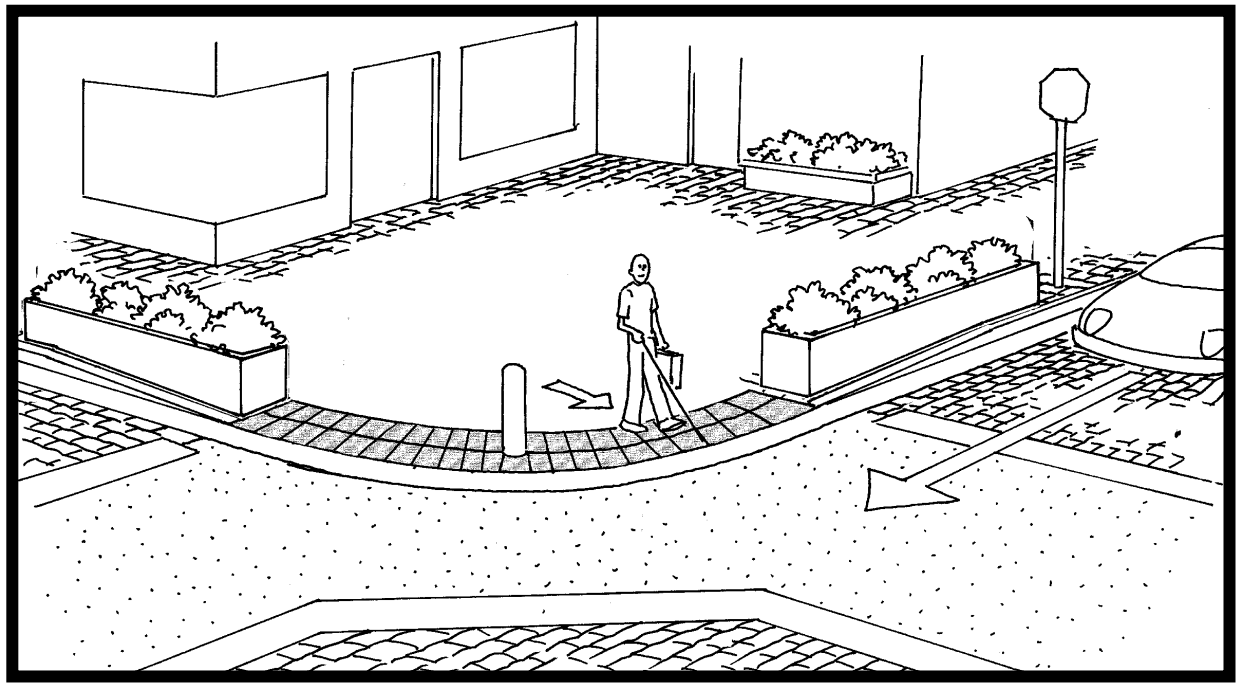
- Need to be protected by a parking lane
- Must not intrude on space for bicyclists nor interfere with bicycle travel
- Requires more maintenance, especially if driven over by cars parking

Depressed Blended Corners



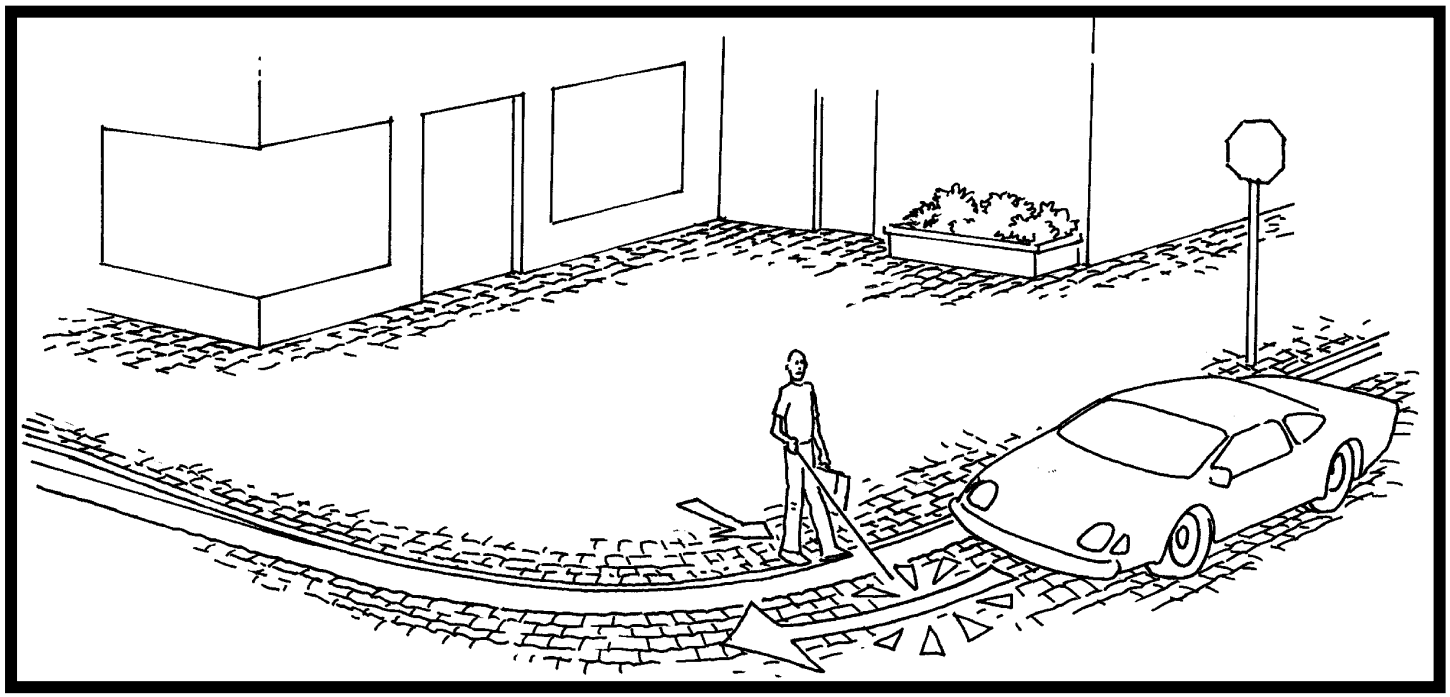
Designed as an expanded diagonal curb ramp that extends around the entire corner at the intersection

Depressed Blended Corners



The level of the sidewalk, through an almost undetectable change in slope is lowered to meet the grade of the street

Disadvantages of Depressed Blended Corners



Does not provide adequate information about the change from pedestrian to vehicular use – should only be installed with detectable warning on the full width of ramp

Disadvantages of Depressed Blended Corners

- Allows large trucks to encroach onto the sidewalk to make tight turns, which puts pedestrians at risk
- Gives children and people with cognitive impairments the illusion that the sidewalk and the street are a unified pedestrian space (an unsafe illusion)

Disadvantages of Depressed Blended Corners

- Guide animals may not distinguish the boundary and continue walking
- Motorists may encroach on the sidewalk, enabling them to turn at higher speeds and making it less likely that they will notice or be able to quickly stop for pedestrians

Drainage

- To prevent standing water and debris from collecting at the bottom of curb ramps:
  - The running grade of the ramp must be steeper than the counter grade of the gutter
  - A steeper counter grade for the gutter can resume outside the ramp width

Drainage

- To prevent standing water and debris from collecting at the bottom of curb ramps:
  - Widen the gutter pan and flatten at the ramp
  - Place inlets upstream of ramps

Drainage Solution

Ramp running grade must be steeper than the counter grade of the gutter

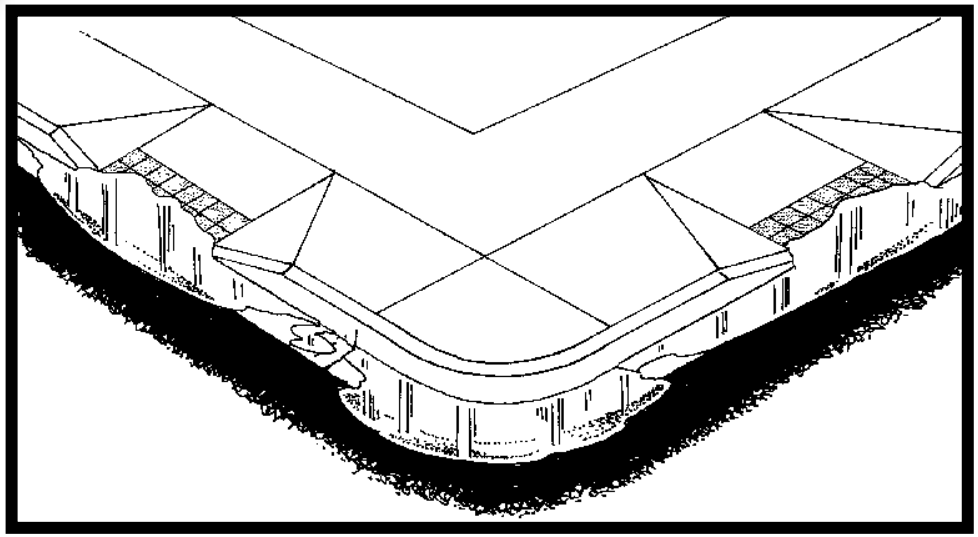
Drainage Solution

Steeper gutter counter grade can resume outside ramp width

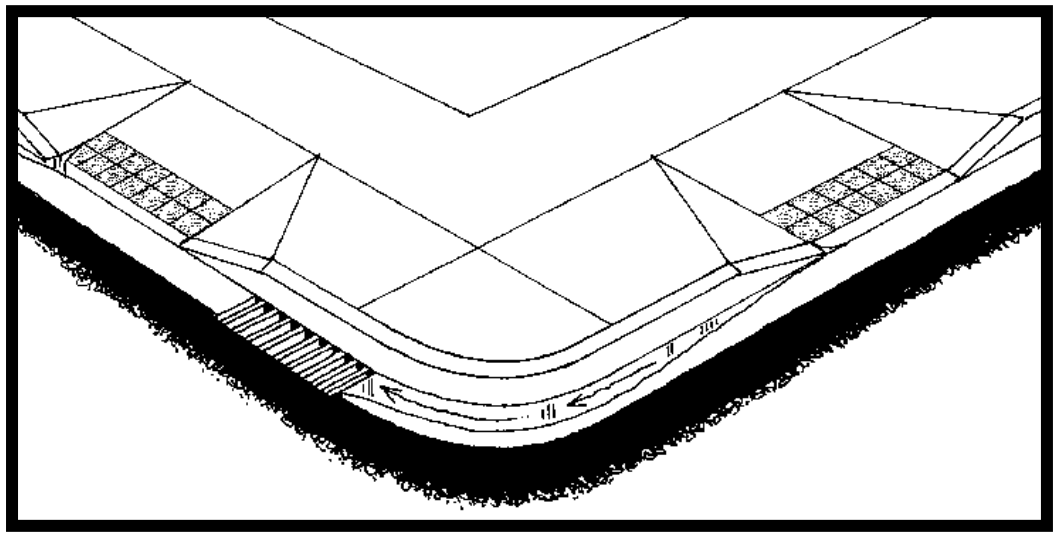
Drainage Solution

Widen the gutter pan and flatten to 2% at ramp

Drainage Solution

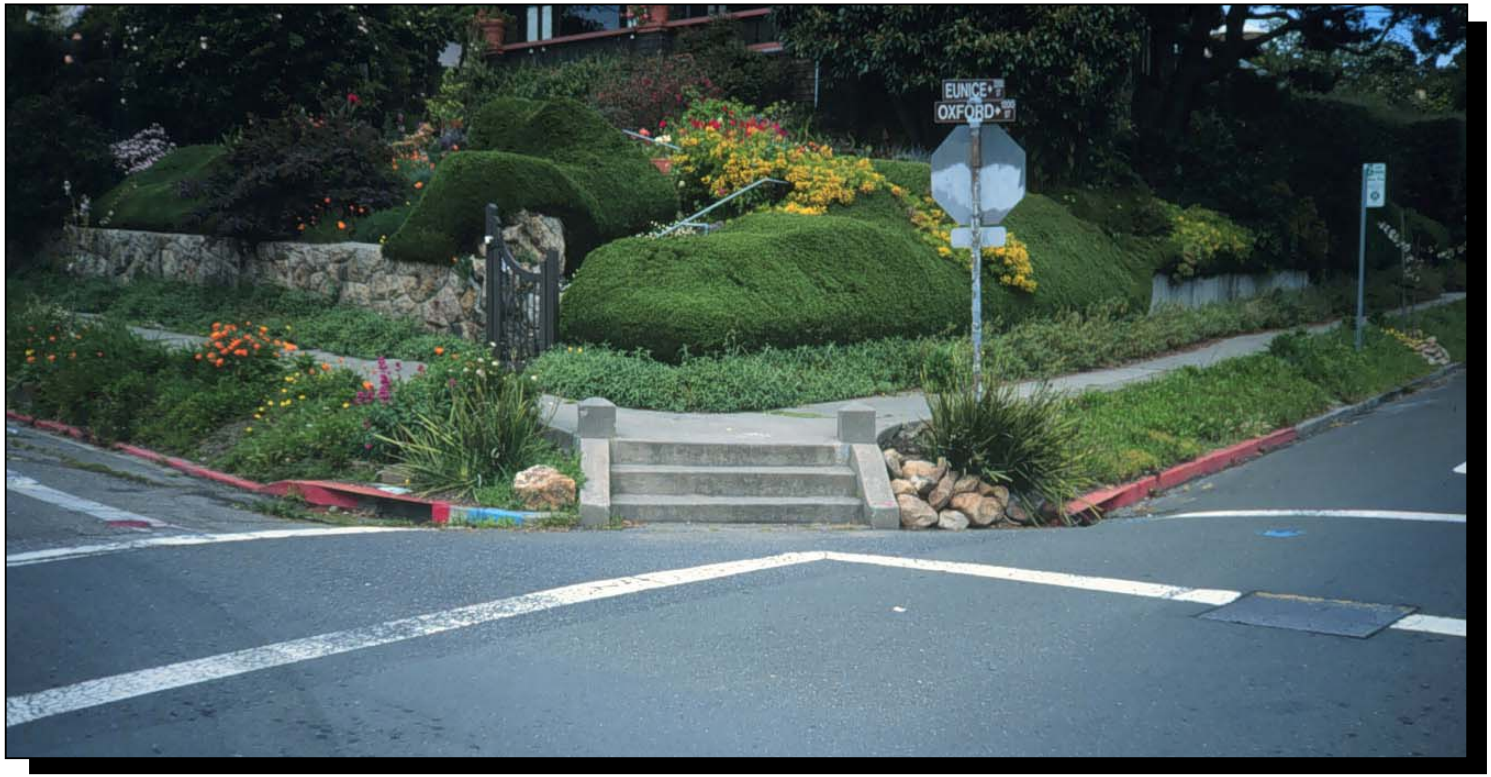


Inlets need to be placed upstream of curb ramps



Evaluating Curb Ramps

Curb ramp placement and design, as well as drainage and utilities, all need to be evaluated for optimum usability



What's wrong with this picture?