WYDOT ADA GUIDELINES FOR ACCESSIBILITY

2017

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The guidance contained herein does not constitute a standard and shall be used in conjunction with existing WYDOT design standards and documentation.

INTRODUCTION: This document is intended to aid the designer in selecting a workable solution for pedestrian access routes for all pedestrians including pedestrians with mobility, visual and any other types of impairments. The document contains multiple design options following the criteria stated in the Wyoming Department of Transportation Standard Plans as well as the Public Rights of Way Accessibility Guidance (PROWAG). This document will establish specific technical information (dimensions, slopes, etc.) required by law as well as allowing some flexibility for retrofitting pedestrian access routes to existing facilities.

AUTHORITY FOR ASSURING COMPLIANCE WITH ADA DESIGN STANDARDS: WYDOT's current Design Guides allow the concerned parties considerable flexibility in the selection of roadway design standards to be used on a particular project. Design exception requests are seldom required, but when they are, approval authority rests with WYDOT's Executive Staff and, when required, with the Federal Highway Administration.

However, authority for the interpretation and enforcement of ADA design standards rests with the US Department of Justice, and ultimately with the US court system. Non-compliance with ADA design standards is considered to be a violation of the civil rights of disabled individuals.

There is no design exception process to obtain approval for not complying with ADA design standards. If complying with ADA design standards is not practical, experts in the area of ADA design encourage designers to thoroughly document the reasons for non-compliance.

Non-compliance can sometimes occur for other reasons. For example, a wheelchair ramp that has an as-constructed slope of 8.5 percent due to normal construction tolerances is non-compliant because this slope slightly exceeds the maximum 1V:12H slope (8.3 percent) given in ADA design standards.

Even if a non-compliant installation is documented, and is due to normal construction tolerances, etc., such installations could be the subject of a legal action initiated by the Department of Justice, by disabled users of the facility, etc.

GENERAL REQUIREMENTS FOR DESIGN OF ADA FACILITIES: In general, facilities used by pedestrians are designed in accordance with ADA requirements so that they are fully accessible to disabled individuals.

In general, the primary purpose of WYDOT Reconstruction projects on urban streets is to completely replace the existing roadway surfacing and all adjacent facilities, such as curb & gutter, sidewalks, driveways, etc. On WYDOT Reconstruction projects, all facilities used by

pedestrians must be designed in accordance with ADA requirements so that they are fully accessible to disabled individuals.

In general, the primary purpose of most WYDOT Preservation projects on urban streets is to replace a badly deteriorated roadway surface by various methods. Such projects are referred to as alterations in ADA regulations, and ADA requirements for alteration projects are somewhat different than those for reconstruction projects.

Several types of surfacing strategies considered to be alterations by ADA regulations are:

A. New layer of surface material
B. Reconstruction
C. Concrete pavement rehabilitation (full slab replacement) and reconstruction
D. Open-graded surface course
E. Microsurfacing and thin lift overlays
F. Cape seals (slurry seal or microsurfacing over a new chip seal)
G. In-place asphalt recycling

On WYDOT Preservation projects that fall into the ADA alteration category, facilities used by pedestrians in all corner areas at intersections must be designed in accordance with ADA requirements so that they are fully accessible to disabled individuals. Pedestrian facilities located between intersections do not have to be upgraded to meet ADA requirements on preservation projects.

The primary purpose of some WYDOT Preservation projects on urban streets is to rehabilitate a roadway surface that is somewhat deteriorated by various methods.

Some surface treatments that are not considered to be alterations by ADA regulations are:

A. Painting pavement markings, excluding parking stall delineations
B. Crack filling and sealing
C. Surface sealing
D. Chip seals
E. Slurry seals
F. Fog seals
G. Scrub sealing
H. Joint crack seals
I. Joint repairs
J. Dowel bar retrofits
K. Spot-high friction treatments
L. Diamond grinding
M. Minor street patching (less than 50 percent of the pedestrian street crossing area)
N. Curb and gutter repair or patching outside the pedestrian street crossing

O. Minor street repair that does not include the turning space and curb ramps
P. Filling pot holes
Q. Installation of a traffic sign (as long as it does not violate the protruding objects requirement).
R. Installation of a traffic or pedestrian signal (as long as it does not violate the access requirement).
S. Installation of a bench, trash receptacle, etc. adjacent to the pedestrian access route as long as it is not placed in a manner that would reduce the sidewalk width below the minimum requirement.

Reasons surfacing strategies considered to be alterations by ADA regulations however cannot be made 100 percent compliant due to "Technical Infeasibility" are:

A. Right-of-way availability. Right-of-way acquisition in order to achieve full compliance is not mandatory, however, it should be considered.
B. Underground structures that cannot be moved without significantly expanding the project scope.
C. Adjacent developed facilities, including buildings that would have to be removed or relocated to achieve accessibility.
D. Drainage cannot be maintained if the feature is made accessible.
E. Notable natural or historic features that would have to be altered in a way that lessens their aesthetic or historic value.
F. Underlying terrain that would require a significant expansion of the project scope to achieve accessibility.
G. Street grades within the crosswalk exceed the pedestrian access route maximum cross slopes, provided an engineering analysis has concluded that it cannot be done without significantly expanding the project scope.

On WYDOT Preservation projects that do not fall into the ADA alteration category, pedestrian facilities may not have to be upgraded to meet ADA requirements, at this time.

In general, the purpose of a WYDOT Rehabilitation project on urban streets is to retain portions of the existing roadway while making major upgrades; e.g., by widening and overlaying to add additional lanes to an existing street.

Consequently, the concerned parties should give careful consideration to deciding how ADA facilities will be upgraded on such projects to be consistent with the nature of the adjacent roadway work. On a widen and overlay project, for example, the adjacent pedestrian facilities will probably be reconstructed and should be designed in accordance with ADA requirements so that they are fully accessible to disabled individuals.

All concerned parties involved in the decision making process (from District, from Highway Development, etc.) are professionally responsible for the types and locations of ADA upgrades that are incorporated into a particular WYDOT Rehabilitation project.

Specific ADA requirements (e.g., minimum width, maximum cross slope, maximum longitudinal slope, etc. for wheelchair ramps) and the manner in which they are applied on different types of projects are given later in this document.

GENERAL REQUIREMENTS FOR INSTALLATION OF WHEELCHAIR RAMPS: In general, it is desirable to construct directional wheelchair ramps at every corner of every intersection on an urban street to accommodate the movements of disabled individuals who wish to cross the street or the side street, in accordance with the following provision given in the 2011 edition of *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way* by the United States Access Board:

> "Curb ramps, blended transitions, or a combination of curb ramps and blended transitions must connect the pedestrian access routes at each pedestrian street crossing. Typically, two curb ramps must be provided at each street corner.
>
> All pedestrian street crossings must be accessible to pedestrians with disabilities. If pedestrian crossing is prohibited at certain locations, 'No Pedestrian Crossing' signs should be provided along with detectable features such as grass strips, landscaping, planters, chains, fencing, railings or other barriers."

The concerned parties should give careful consideration to selecting the locations at which wheelchair ramps will be installed on particular projects.

For example, it may be appropriate to install wheelchair ramps on every corner of every intersection on a low speed, low volume, two-lane urban street located in a residential area, to allow disabled individuals to cross the street or the side street as desired.

However, due to the pedestrian safety considerations, it may be appropriate to install wheelchair ramps that allow disabled individuals to cross a high speed, high volume, urban street located in a commercial area only at signalized intersections. In this case, it may also be appropriate to install signs prohibiting all pedestrians from crossing the street where wheelchair ramps are not provided.

All concerned parties (from District, from Highway Development, etc.) are professionally responsible for the selection of locations where wheelchair ramps are or are not installed, where signs prohibiting pedestrians from crossing the street and associated detectable features are or are not installed, etc. ADA does not require installations of ramps or curb ramps in the absence of a pedestrian access route.

SURVEYS FOR DESIGN OF ADA FACILITIES: Numerous geometric constraints must be considered and numerous design standards must be met in the design and construction of any ADA facility.

Therefore, the design of ADA facilities often requires a detailed preliminary survey and an intensive design effort, even though the construction cost of these facilities is often a small proportion of the total cost; for example, of a WYDOT Preservation project in an urban area.

The concerned parties should give careful consideration to selecting the type of preliminary survey and to determining the responsibilities of different WYDOT programs in the design of ADA-compliant facilities on a particular project. This decision is especially important for WYDOT Preservation projects (ADA alteration projects) with many geometric constraints; i.e., where the encroachment of new ADA facilities on adjacent property should be avoided if practical, where the new ADA facilities must be tied into existing sidewalks, building entrances, curb & gutter flowlines, etc.

The decision to use a minimal survey (e.g. aerial photos with an approximate scale, little or no control, etc.) for the development of contract plans and summaries places professional responsibility for laying out and constructing ADA-compliant facilities mainly on the Resident Engineer. On such projects, the preliminary ADA layouts, quantities of pay items, etc. given in the contract plans may have to be modified significantly during construction to obtain a facility that ties into adjacent facilities properly and is in accordance with all applicable ADA design standards.

The decision to use an intermediate survey (e.g., field DTM with control survey) for the development of contract plans and summaries places professional responsibility for laying out ADA-compliant facilities on the Project Development Squad Leader and on the Resident Engineer. On such projects, it is advisable to check the preliminary layouts developed by Project Development in the field, to obtain additional field survey data, to modify the layouts, etc., if necessary, before the job is let to contract. On such projects the ADA layouts, quantities of pay items, etc. given in the contract plans, the tie-ins to adjacent facilities, etc. should not require major modifications during construction.

The decision to use a high level survey (e.g., mapping developed from Lidar scans in areas where ADA facilities will be constructed, with a control survey) for the development of contract plans and summaries places professional responsibility for laying out ADA-compliant facilities primarily on the Project Development Squad Leader. On such projects, additional survey information can be obtained from the Lidar scan and can be added to the mapping, ADA layouts can be modified, etc. if necessary. On such projects the ADA layouts, quantities of pay items,

etc. given in the contract plans, the tie-ins to adjacent facilities, etc. should require only minor modifications during construction.

Careful consideration should be also given to determining whether or not a land survey will be required for the design of the ADA facilities on a particular project. ADA facilities are often located close to existing right-of-way boundaries, and a land survey of these boundaries may be necessary to assure the locations of the facilities determined during design do not encroach on adjacent property.

If the concerned parties determine that it is appropriate for the ADA facilities on particular project to encroach on adjacent property, a land survey must be done to develop the property descriptions necessary to acquire additional right-of-way.

1.) GENERAL REQUIREMENTS:

General requirements apply to all new and disturbed pedestrian access routes. The designer should refer to the WYDOT Standard Plans for other requirements governing accessibility.

A.) SURFACING: All surfaces should be smooth, firm and slip resistant. Concrete or asphalt pavement are the preferred surface treatments for pedestrian access routes. Bricks and pavers should not be used as surface treatment for walking areas due to:

a.) High installation and maintenance costs
b.) Buckling in areas encountering freeze-thaw cycles
c.) Uneven surfaces that create tripping hazards for pedestrians, especially senior citizens and pedestrians using assistive equipment
d.) Rougher surfaces that may cause jarring for wheelchair users with spinal injuries
e.) Greater difficulty in detecting truncated domes for pedestrians with visual impairments

Preference is to provide smooth, slightly textured for slip resistant concrete in the pedestrian zone and pavers or stamped concrete in the furniture zone, as shown in Figure 2.

B.) LEVEL INCONSISTENCIES: Causes of level inconsistencies may be due to freeze-thaw cycles, tree roots, expansion joints, manholes, valve covers, etc. Abrupt changes in level to any degree are strongly discouraged. However, up to ¼ inch is allowed; between ¼ inch to ½ inch should be beveled with a 1V:2H (50 percent) bevel. The bevel should continue for the entire width of the vertical surface discontinuity. Changes in level due to freeze-thaw cycles, tree roots, poor construction, etc. greater than ½ inch should be patched smooth or restored to the previous grade, up to a maximum of 8.3 percent. Level inconsistencies are allowed for the occasional expansion joints and objects such as utility covers, vault frames and grates that cannot be located in another area of the sidewalk corridor outside of the pedestrian access route. However, to the maximum extent feasible, objects such as utility covers, vault frames and gratings should not be located on curb ramp runs, blended transitions, turning spaces, or gutter areas within the pedestrian access route.

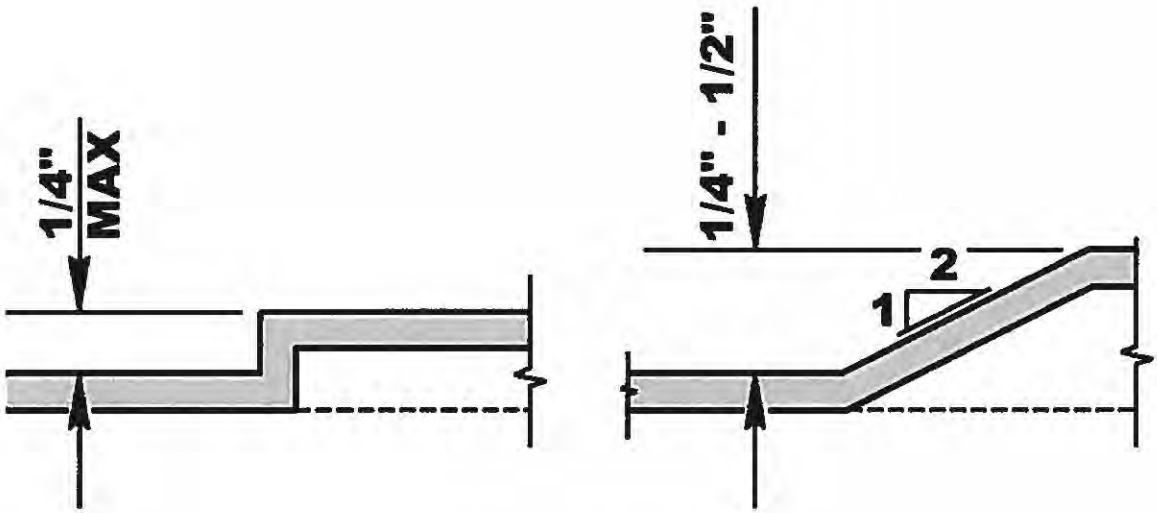


FIGURE 1: Level Inconsistencies

C.) SIDEWALK CORRIDOR: The sidewalk corridor or what is generally referred to as "sidewalk" is the area from the edge of the roadway to the edge of the public right of way which is established for public use. The sidewalk corridor can generally be divided into four parts; which are listed below and shown in Figure 2.

a.) Curb Zone
b.) Furniture Zone
c.) Pedestrian Zone
d.) Frontage Zone

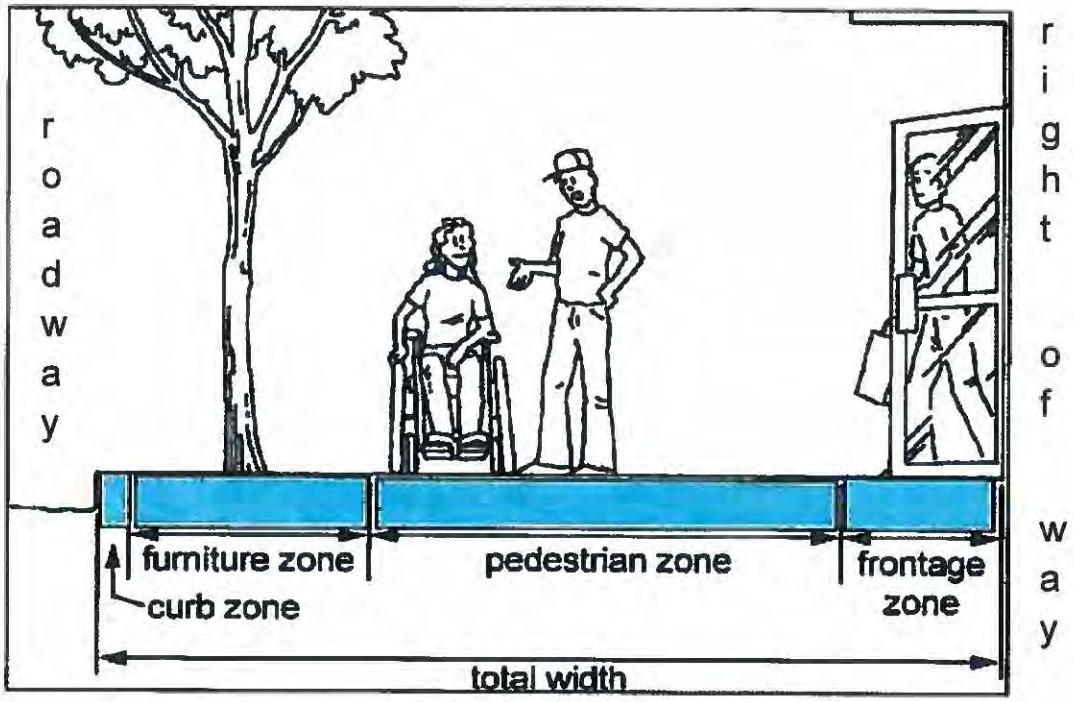


Figure 2: Sidewalk Zones

Curb Zone: The curb zone physically separates vehicles from pedestrians by a vertical constraint. The curb zone also facilitates drainage by directing water away from pedestrians and into storm sewer inlets. The curb also acts as a cue for visually impaired pedestrians.

Furniture Zone: The furniture zone is the area between the curb zone and the pedestrian zone. This area is a multipurpose area and uses vary from benches, utility poles, landscaping, fire hydrants, traffic signs, snow storage and numerous other items. In residential areas, the furniture zone usually consists of a simple strip of lawn sometimes containing trees and landscaping. In commercial areas, the

furniture zone takes on a greater significance by acting as an area for sidewalk furniture and numerous other objects that would impede pedestrian travel. Furniture and any other objects in the furniture zone should not be placed closer than two feet behind the curb to allow car doors to open and pedestrians to access the area.

The furniture zone should be clear at intersections in order to maintain sight lines for both pedestrians and motorists. The furniture zone should slope away from the sidewalk toward the street. A slope of approximately 4 percent is recommended. Greater slopes are permitted and often necessary to account for grade differences between the sidewalk and the curb.

Pedestrian Zone (sidewalk): This is the zone designated solely for pedestrian travel. Although maybe not as aesthetically pleasing, straight walking areas are preferred over weaving and meandering walking areas as they are more convenient for pedestrians and easier to navigate by the visually impaired. The pedestrian zone is primarily the zone this document will address. This zone should be kept clear of all obstacles and obstructions. Consideration may be given to a wider than standard (five feet) pedestrian zone in areas with higher levels of pedestrian traffic, such as commercial areas.

Frontage Zone: The frontage zone is the area between the pedestrian zone (sidewalk) and the public right of way. In commercial areas and business districts, the frontage zone allows pedestrians room to avoid business fronts and doorways that swing out into the zone. In residential areas the frontage zone is usually an area that allows municipalities room enough to maintain (maneuvering space) sidewalk without seeking permission from each adjacent property owner. This distance is usually around one foot wide in residential areas and somewhat more in commercial areas. This zone may be considered a blending area to account for grade differences between the pedestrian zone (sidewalk) and the right-of-way.

D.) PEDESTRIAN ACCESS ROUTE (PAR): The Pedestrian Access Route is a continuous and unobstructed walkway within a pedestrian circulation path that is specifically designed for ADA-accessible pedestrian travel. Not to be confused with sidewalk corridor. The Pedestrian Access Route consists of sidewalks, pedestrian circulation paths, curb ramps (excluding flares), pedestrian street crossings, pedestrian rail crossings, overpasses, underpasses and doors and doorways. The Pedestrian Access Route is comparable to the Sidewalk Zone of the Sidewalk Corridor.

E.) HORIZONTAL OPENINGS (Grates): Horizontal openings in grates shall not allow the passage of a ½ inch or larger sphere. Elongated openings shall be oriented so that the long dimension is perpendicular to the dominant direction of travel, as shown in Figure 3. The use of grates within the pedestrian access route is discouraged; however, where necessary, the grate should be located outside of curb ramps, gutter area at end of ramps, turning spaces or landings.

NOTE: Presently none of the inlet grates shown in the WYDOT Standard Plans meet the requirements for use within a pedestrian access route; therefore none are allowed in the pedestrian zone.

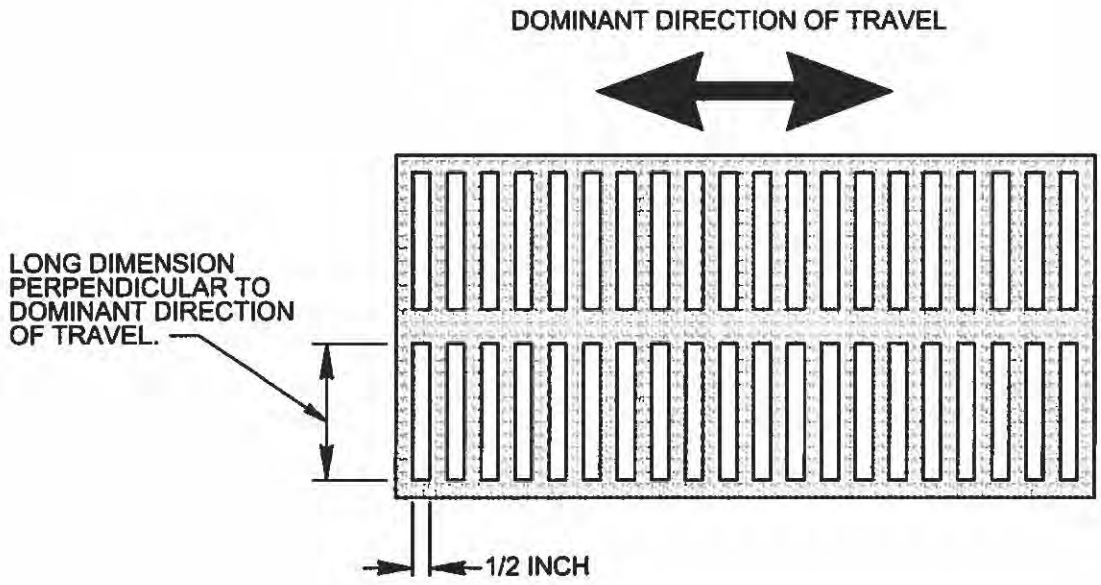


Figure 3: Horizontal Openings

F.) PROTRUDING OBJECTS: Objects that are protruding between the heights of 27 inches and 80 inches within the pedestrian zone cannot extend more than 4 inches from the fixed structures into the sidewalk, as shown in Figure 4.

Objects mounted below 27 inches or above 80 inches within the pedestrian zone may extend no more than 12 inches from the fixed structure into the sidewalk. Designers should be aware of these criteria when placing such items as drinking fountains, benches, trash receptacles, fire hydrants, bike racks, etc. near the sidewalk.

It is preferred that utilities be located behind the sidewalk. If space behind the sidewalk is not available, utilities may be located within the green space or furniture zone between the face of the curb and sidewalk. The designer should keep in mind the AASHTO Green Book recommends a minimum 18 inches from curb face to utility poles. If utility poles must be located in the sidewalk, they should be placed consistently either right or left of center to provide somewhat of a corridor. Many times a designer is faced with finding locations for utility poles, signal cabinets, mailboxes, etc. outside of the pedestrian space. In some instances, additional right-of-way may be required.

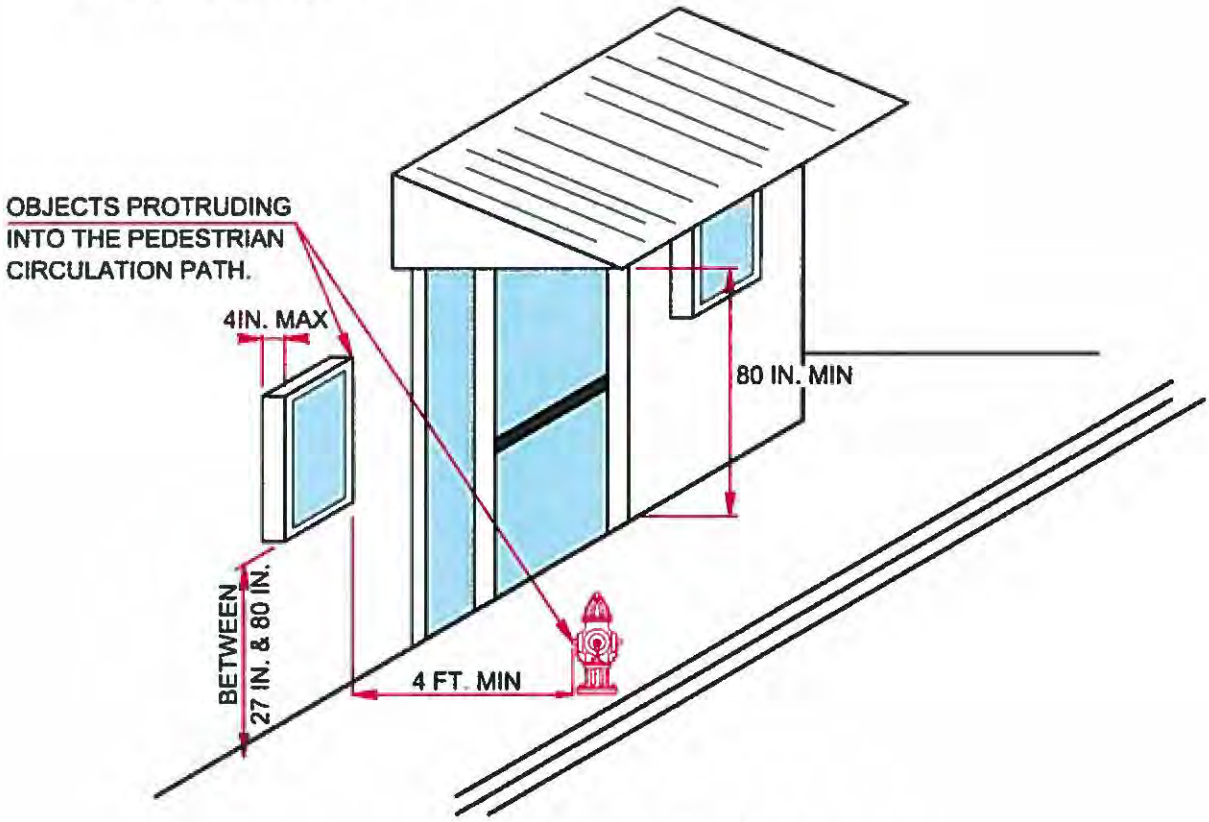


Figure 4: Protruding Objects

2.) STANDARD SIDEWALKS:

WYDOT's goal for sidewalk construction is to make continuous connections to existing sidewalks, schools, public buildings, bus stops and other pedestrian destinations. Sidewalks will be designed to meet all federal requirements and to facilitate all pedestrians, including those with disabilities.

With consideration given to PROWAG guidelines, WYDOT requires the following:

A.) The minimum width for standard sidewalk is 5 feet – not including the top of curb dimension. Four feet wide sidewalk may be used in extreme cases; however, these widths must be accompanied by passing zones.

B.) Where the width of the sidewalk is less than 5 feet, passing zones are required at a maximum 200 feet interval. The passing zones must be a minimum of 5 feet by 5 feet as shown in Figure 5. The sidewalk may be considered part of the passing zone requiring a widening up to 5 feet. Use of driveways and sidewalks from residence to streets as passing zones is acceptable as long as cross-slope requirements and widths are met.

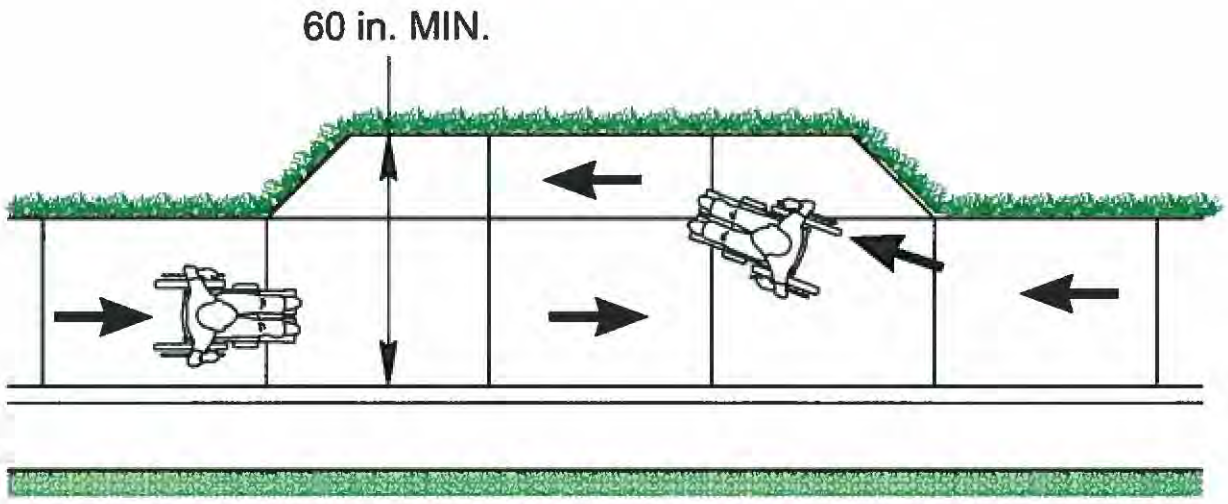


Figure 5: Passing Zone

C.) Sidewalk cross-slope should not exceed a maximum of 2 percent sloping towards the roadway, including crossings of driveways. The designer should consider designing with a cross-slope of 1.5 percent, as this will allow for construction tolerances.

D.) Sidewalk running slope (grade) where sidewalk is adjacent to existing and reconstructed roadways can be equal to but no steeper than the grade of the

adjacent roadway. If the sidewalk is located within the roadway right-of-way it is considered "adjacent", within reason.

E.) When sidewalk is separated from the roadway, the maximum grade without landings (rest stops) will be 5 percent. A sidewalk can have a grade between 5 percent and 8.3 percent if level landings are provided every 2.5 feet of vertical change. Level landing areas cannot exceed a 2 percent positive slope in all directions of travel.

F.) Where sidewalk is placed on a bridge or a large culvert, the minimum clear width for travel shall be 60 inches.

G.) The Pedestrian Zone must be constructed of a smooth uniform material for the entire width.

3.) RAMPS:

Most curb ramps consist of six primary components: approaches, landings/turning space, ramps, gutters, flares, and a detectable warning device, as shown in Figure 6.

There shall be a flush transition with NO lip between each of these six primary components.

The six main components of standard curb ramp design.

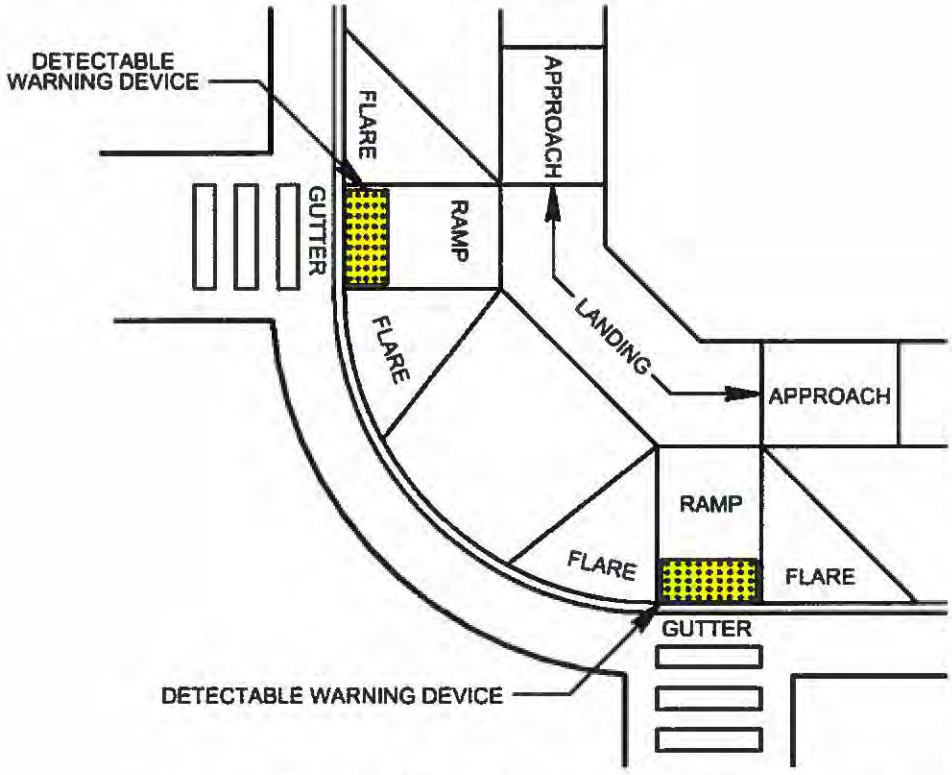


Figure 6: Standard Perpendicular Curb Ramp Components

A.) APPROACH: This is the area of interface between the curb ramp and the sidewalk. The approach is built using the same design criteria as the standard sidewalk (same width, cross-slope and grade). The approach is an area of transition between an existing sidewalk and a new landing/turning space. The approach grade may be increased to a maximum grade of 8.3 percent if the landing level is below the elevation of the adjoining sidewalk.

B.) LANDINGS: Sometimes referred to as "Turning Space". Landings provide a level area with a cross-slope of 2 percent or less in any direction, although positive drainage to the street is advised. The landing is an area intended for the wheelchair user to wait, to move into or out of the ramp or to bypass the ramp. Landings should be 5 feet by 5 feet, however, if existing, 4 feet by 4 feet can be left in place. Landings for multiple ramps may overlap.

C.) RAMP: Ramps provide the sloped area between the landing and the gutter. Maximum grade for ramps is 8.3 percent (1V:12H). Standard ramp width is 5 feet, however 4 feet if existing, may be left in place if conditions prohibit a wider ramp. Ramps should be oriented perpendicular to the curb if possible, including radius. The transition between the ramp and gutter must be smooth with no lip. Ramps should be located to minimize pedestrian exposure to traffic.

D.) GUTTERS: To provide roadway drainage, gutters require a counter slope at the point where the ramp meets the street. The counter slope should not exceed 5 percent. Two percent is the normal cross-slope for a city street to prevent water accumulation and problems associated with freezing. The algebraic difference in slope between the gutter and the adjacent ramp shall not exceed 13 percent. The ramp shall meet the gutter flush, without a lip, raised joint or gap.

E.) FLARES: Flares are not considered part of the pedestrian access route because they are generally steeper than the ramp and often feature significant cross-slopes with excessive rate of change of cross-slope. WYDOT recommends flare slopes not to exceed 10 percent (1V:10H) with 8.3 percent (1V:12H) preferable. The 10%/8.3% slope is measured where the flare is directly adjacent to the back of curb. If a curb ramp is located where a pedestrian might normally walk, flares are useful indicators to people with visual disabilities. Flares may be replaced with returned curbs if the curb ramp is protected from cross travel by landscaping, street furniture, fencing, railings or other barriers.

F.) DETECTABLE WARNING DEVICES: A detectable warning device is a standard feature built into the sidewalk or ramp that alerts visually impaired individuals to the presence of a hazard in the line of travel. Place detectable warning devices across the entire width of ramp, beginning at the back of curb and extending 2 feet minimum up the ramp. If the ramp is skewed to the curb, place the detectable warning device perpendicular to the ramp with the leading corner of the detectable warning device adjacent to the back of curb, as shown in the following figure. To aid

the visually impaired, detectable warning devices should be a contrasting color to the sidewalk material. Orange, yellow or red are the most common colors. The sound and tactile feel of a cane on the device is what warns the blind of an impending cross-walk. The most common device is the "Truncated Dome".

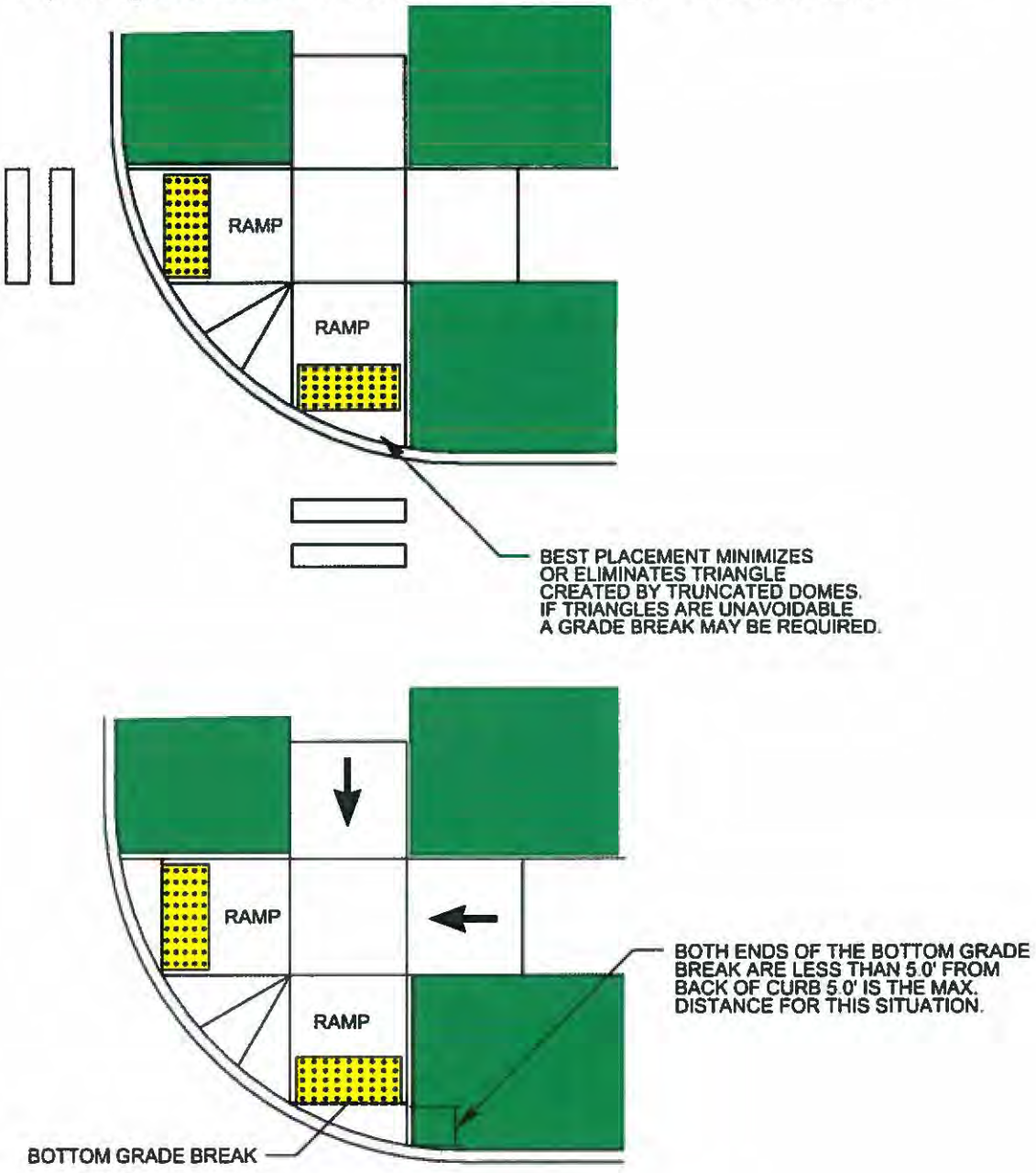


Figure 7: Detectable Warning Devices

Truncated Dome Panels (Detectable Warning Devices) should be arranged to minimize the triangle created at the base of the curb ramp on large radius corners.

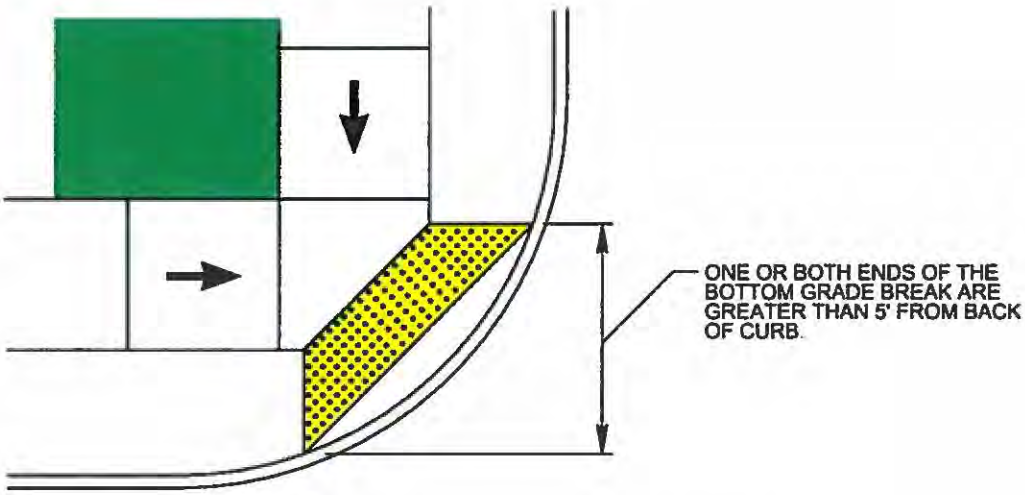


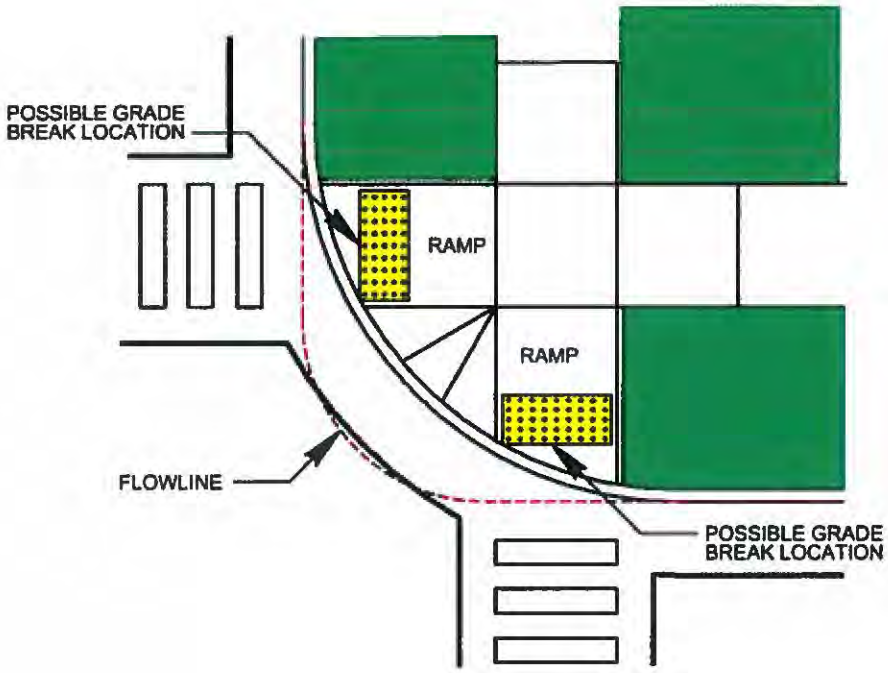
Figure 7 (Cont.): Detectable Warning Devices

G.) If detectable warning devices are placed too far from the curb line because of a large curb radius, the location may compromise effective crossing. The above examples demonstrate the maximum acceptable distance a detectable warning device can be placed and an option if the 5' maximum cannot be achieved.

H.) Grade breaks should be considered at the bottom of the detectable warning device if the ramp is not perpendicular to the curb. Wheelchair users can be very unstable when traveling down a narrow ramp with a slope that is not perpendicular to the curb, because all four wheels are not touching the ground at all times. If the ramp slope is not perpendicular to the curb, wheelchair users either have to:

1. Negotiate changing cross slopes and changing grades simultaneously since one side of the chair will be in the gutter while the other is still on the ramp; or
2. Turn on the ramp in order to have both wheels move from the ramp to the gutter at the same time. When traveling down a curb ramp, the turn must be completed while on a significant grade and within a narrow space.

4.) **RAMP PLACEMENT AND TYPE:** One of the most difficult situations encountered when providing ADA compliance is where to place a ramp and what type of ramp to use.



NOT DESIRABLE

Figure 8: Ramp Placement

In the above drawing as a wheelchair proceeds straight down the ramp into the crosswalk with the ramps situated on a skew to the curb, wheelchair users must negotiate changing cross slopes and changing grades simultaneously. One of the wheelchair tires will be off the ground, which may result in a tipping situation. The scenario in Figure 8 is acceptable, however, if the designer can move the ramps away from each other and align them to be perpendicular to the curb, or if the designer builds a "grade break " perpendicular to the direction of travel located at the bottom of the detectable warning device the situation will be improved. Care should be taken when building a grade break at the bottom of a ramp, as this may cause a need to modify a gutter flow line and/or counter slopes of the gutter location to ensure that "pooling" doesn't occur at the bottom of the ramp in the "clear space."

Aligning ramps with crosswalks is sometimes a problem. Ramps and crosswalks that are aligned to a point where the ramp is perpendicular to the curb may force vehicles to stop well before the intersection, decreasing sight distances, and this may encourage drivers to pull into the crosswalk area. This is especially true on corners with radii greater than twenty five to thirty feet. The designer may consider decreasing the curb radii; however, keep in mind that large

delivery trucks, and school busses may need this radii for turning movements. If radius is decreased the designer may consider increasing the sidewalk depth to prevent cracking and breaking from vehicles encroaching on the sidewalk.

Following are several different types of curb ramps that may assist the designer when selecting placement of ramps. WYDOT Standard Plans also demonstrate a variety of ramp locations. As previously mentioned, ramps should be positioned perpendicular to the curb, if possible. Drainage should be considered when locating ramps. Avoid low spots (sumps) and inlet grates within the path of the ramp.

a.) Perpendicular Curb Ramps: WYDOT's preference is to use paired perpendicular ramps (two ramps on each corner). Large diagonal ramps tend to mislead pedestrians who are visually impaired and are discouraged by ADA unless no other options exist.

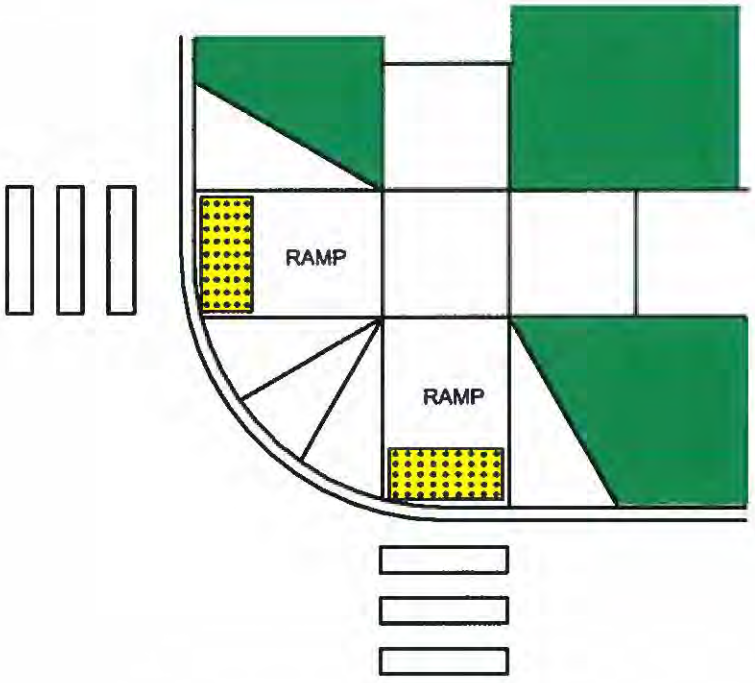


Figure 9 Perpendicular Curb Ramp

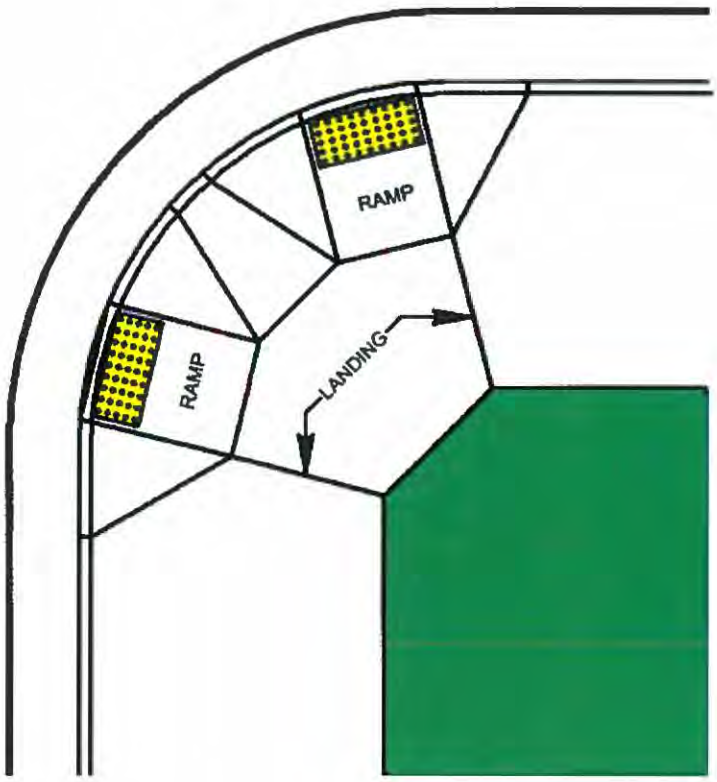
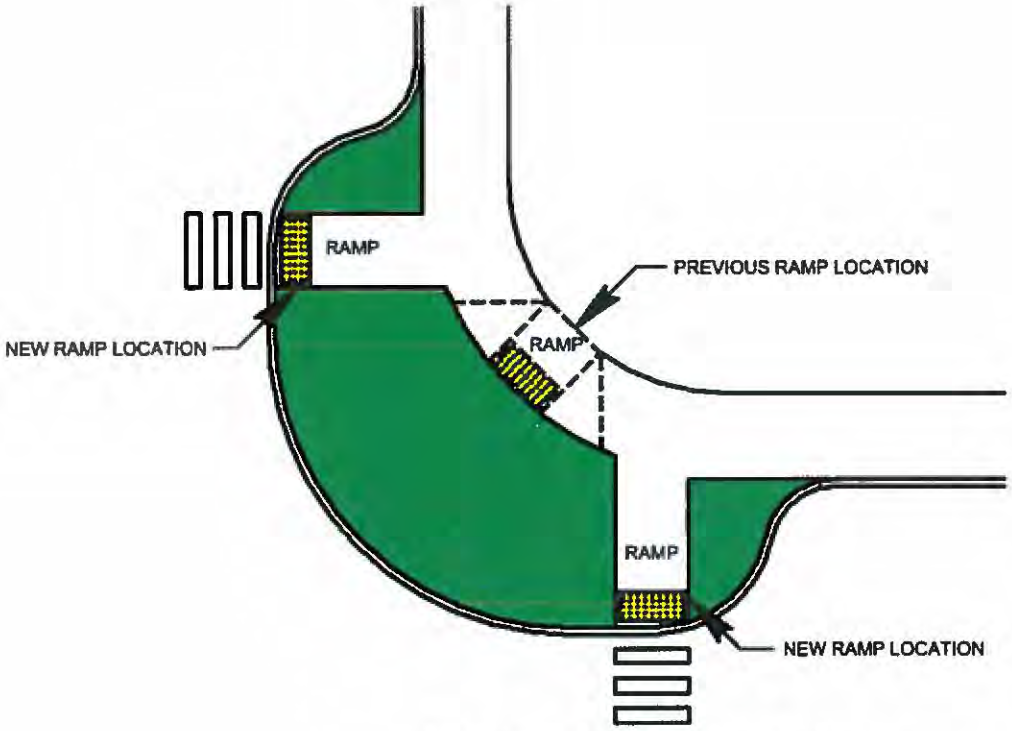
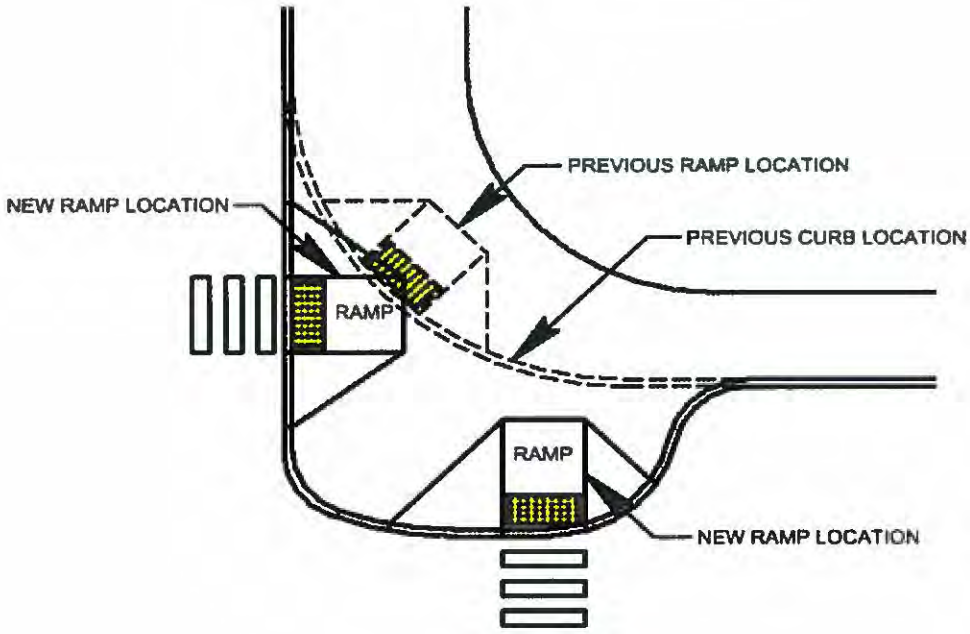


Figure 9 (Cont.): Perpendicular Curb Ramp

b.) Curb extensions (Bulb Outs): Commonly installed on roadways where curb parking exists. In addition to providing additional space for curb ramps, curb extensions shorten the crossing distance for pedestrians, improves sight distance for both pedestrians and motorists, prevents motorists from parking in the crosswalk area, and signals pedestrians' intent to cross. In general, curb extensions should extend the width of the parking lane, approximately 6 feet to 8 feet, from the curb face to allow for parallel parking. A wider curb extension is necessary for angled parking. Curb extensions may also make snow plowing more difficult, because the extensions are not always obvious following heavy snow storms. Generally, due to snow plowing operations, no bulb-outs are allowed on WYDOT traffic routes. It should be noted that bulb-outs in some cases may present a maintenance and safety issue. When plowing snow the parking area between bulb-outs is difficult at best to plow. Snow left in this parking area can create a slipping hazard for pedestrians. Also when the parking area is plowed the bulb-out is difficult to see and gets damaged by the plows.



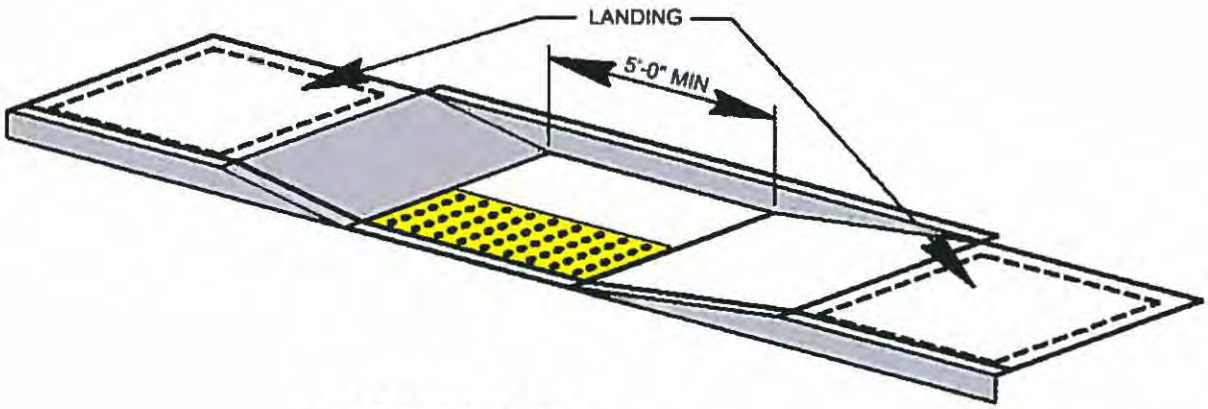
CURB EXTENSION (BULB-OUT) RECOMMENDED



CURB EXTENSION (BULB-OUT) ONE SIDED RECOMMENDED

Figure 10: Bulb Outs

c.) Parallel Curb Ramps: Usually chosen where right-of-way is extremely limited because the landings do not require additional right-of-way. This installation consists of two ramps, both parallel to the direction of travel and both containing a level landing at its top that leads down to one street level landing containing a detectable warning device. Due to the fact that the ramp is essentially at street level, ponding, poor drainage and debris build up may be issues. Parallel curb ramps are effective in areas of steep terrain because the ramps can easily be lengthened to reduce the grades. Parallel curb ramps are often seen at mid-block crossings.



PARALLEL RAMP

Figure 11: Parallel Curb Ramp

d.) Diagonal Curb Ramps (not advised): One perpendicular curb ramp serves two adjacent crosswalks. Diagonal curb ramps force pedestrians to proceed into the intersection before turning to the left or the right to cross the street. This situation increases the danger of being hit by a turning vehicle. When a single diagonal ramp is provided, wheelchair users will be forced to cross in a different location than other pedestrians that are able to negotiate a curb. Visually impaired pedestrians also have problems, as the crosswalk does not line up with the ramp. This scenario may be cheaper and may work better in some retrofit situations but is NOT recommended. If this scenario is used, it must have a 4 feet by 4 feet minimum clear space within the pedestrian crossing and wholly outside the parallel vehicle travel lanes.

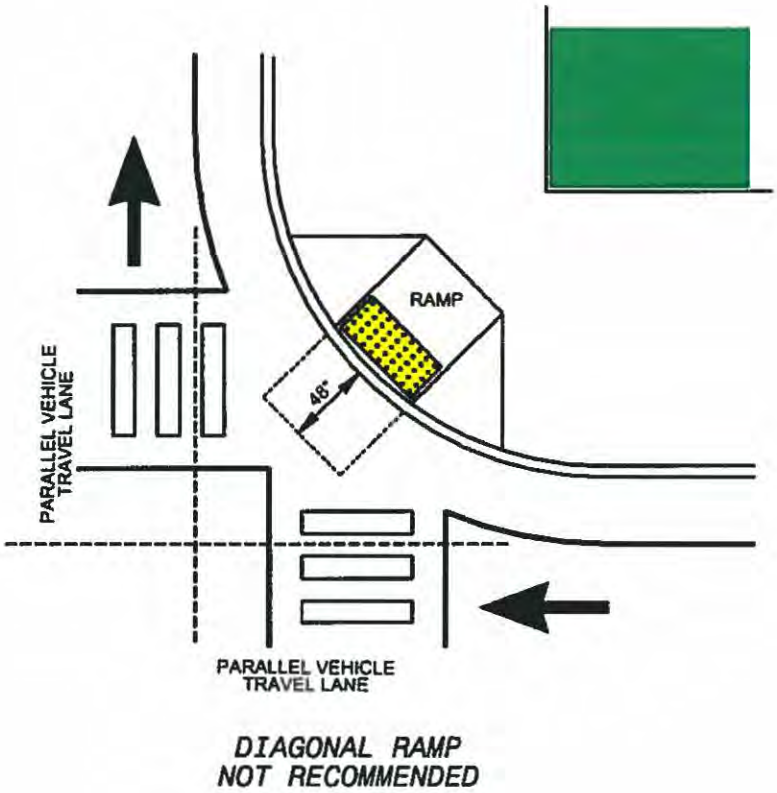


Figure 12: Diagonal Ramps

e.) Built-up Curb Ramps: Usually seen in parking lots. Built-up curb ramps extend into the gutter and roadway and may create drainage problems. These ramps can be very problematic when plowing snow. If used they should only be used on low speed streets. Built-up curb ramps are not commonly installed along streets but are frequently seen in parking lots. When installed in a parking lot they should be installed in a designated area and not installed in the access isles between parking spaces. Built-up curb ramps should NOT be the first choice of curb ramp application. There are a number of maintenance, design and pedestrian safety problems with this type of ramp.

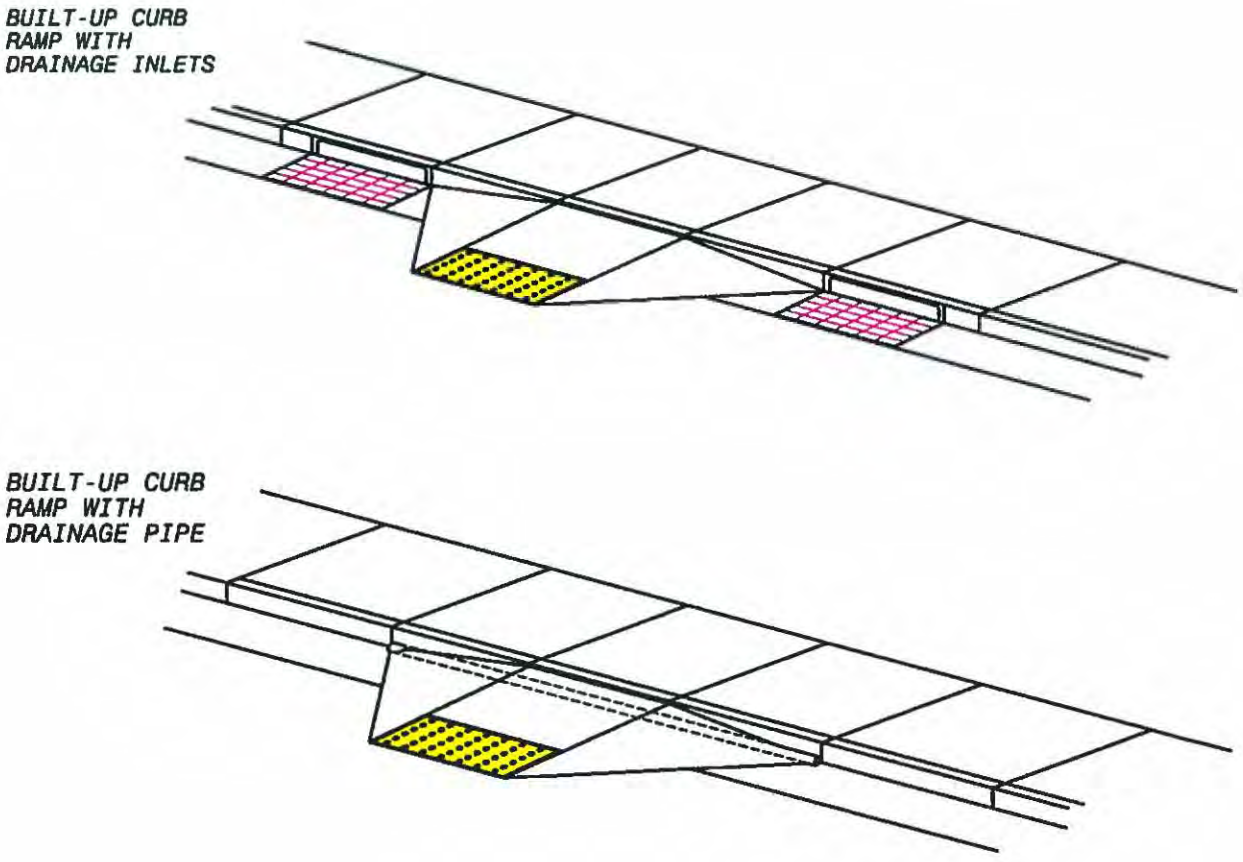
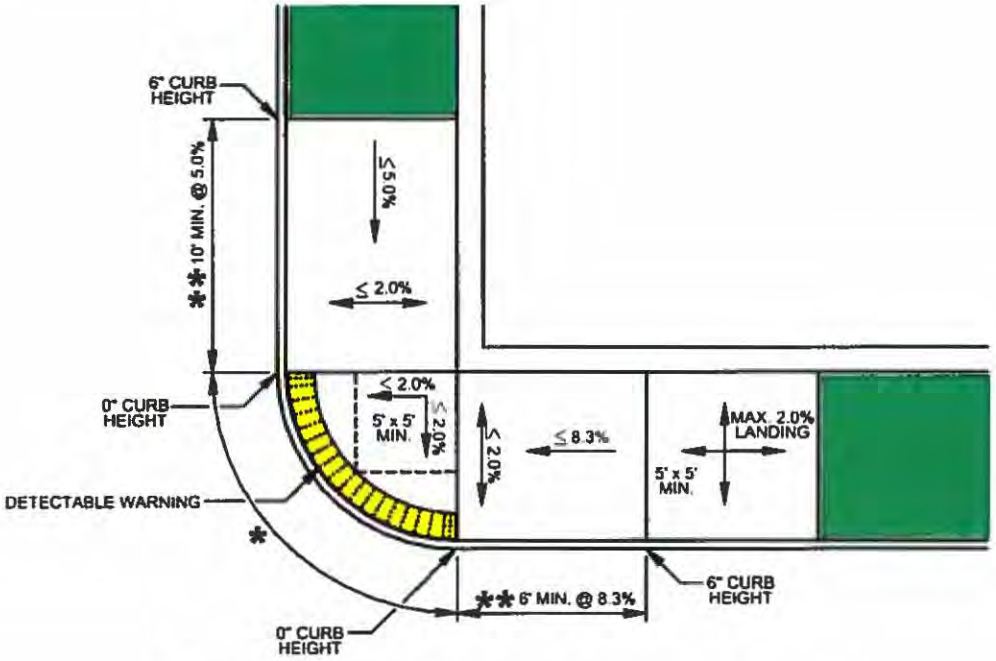


Figure 13: Built-up Curb Ramp

f.) Blended Transitions (Depressed Corners): A blended transition is allowed when conditions warrant, but is not preferred. Design and constructability is difficult to meet compliance requirements. Blended transitions may allow turning vehicles to encroach onto the sidewalk. Blended transitions may direct pedestrians, especially with visual impairments, into the street outside the marked crosswalk. Guide dogs may not be able to distinguish the street edge.



BLENDED TRANSITION (DEPRESSED CORNER) RAMP NOT RECOMMENDED

Figure 14: Blended Transition

*The determination to use a blended transition versus two ramps is made by measuring the distance along the gutter flow line between the interior ramp legs/inside edges of the crosswalk. The separation between the two ramps should be a minimum 5.5 feet. at the curb in order to develop a compliant 1:10 flare with a minimum 3 inch curb height between any pair of proposed ramps. Blended transitions may be considered when a dedicated landing cannot be provided or there is a barrier such as a building immediately at the back of the sidewalk.

** Distances shown could be substantially longer if chasing a grade.

In retrofits, the design requires more concrete removal and replacement to chase grades and should be evaluated for potential drainage issues. The size of the depressed corner should be minimized for various reasons. Generally the larger the depressed area the more problems with drainage and unwanted ponding potentially exist.

5.) CROSS SLOPES

For street crossing, the longitudinal grade of the street now becomes the cross slope for the pedestrian crossing. PROWAG has maximum limits for the cross slope of pedestrian street crossings, which vary depending on the location of the crossing and the type of automobile traffic control at the crossing. These requirements limit the longitudinal grade of a street, or require a "tabled crosswalk" at the intersection.

a.) Intersection Legs with Stop or Yield Signs: For pedestrian crossings across an intersection leg with full stop or yield control (stop sign or yield sign), the maximum cross slope is 2.0 percent (maximum 2.0 percent street grade through the crossing).

b.) Intersection Legs without Stop or Yield Signs: For pedestrian crossings across an intersection leg where vehicles may proceed without slowing or stopping, the maximum cross slope of the pedestrian street crossing is 5.0 percent (maximum 5.0 percent street grade through the crossing).

c.) Running Slope: The running slope of the pedestrian street crossing is limited to a maximum of 5.0 percent (maximum street cross slope or superelevation of 5.0 percent).

d.) Midblock street crossings, the cross slope of the pedestrian crossing is allowed to equal the street grade.

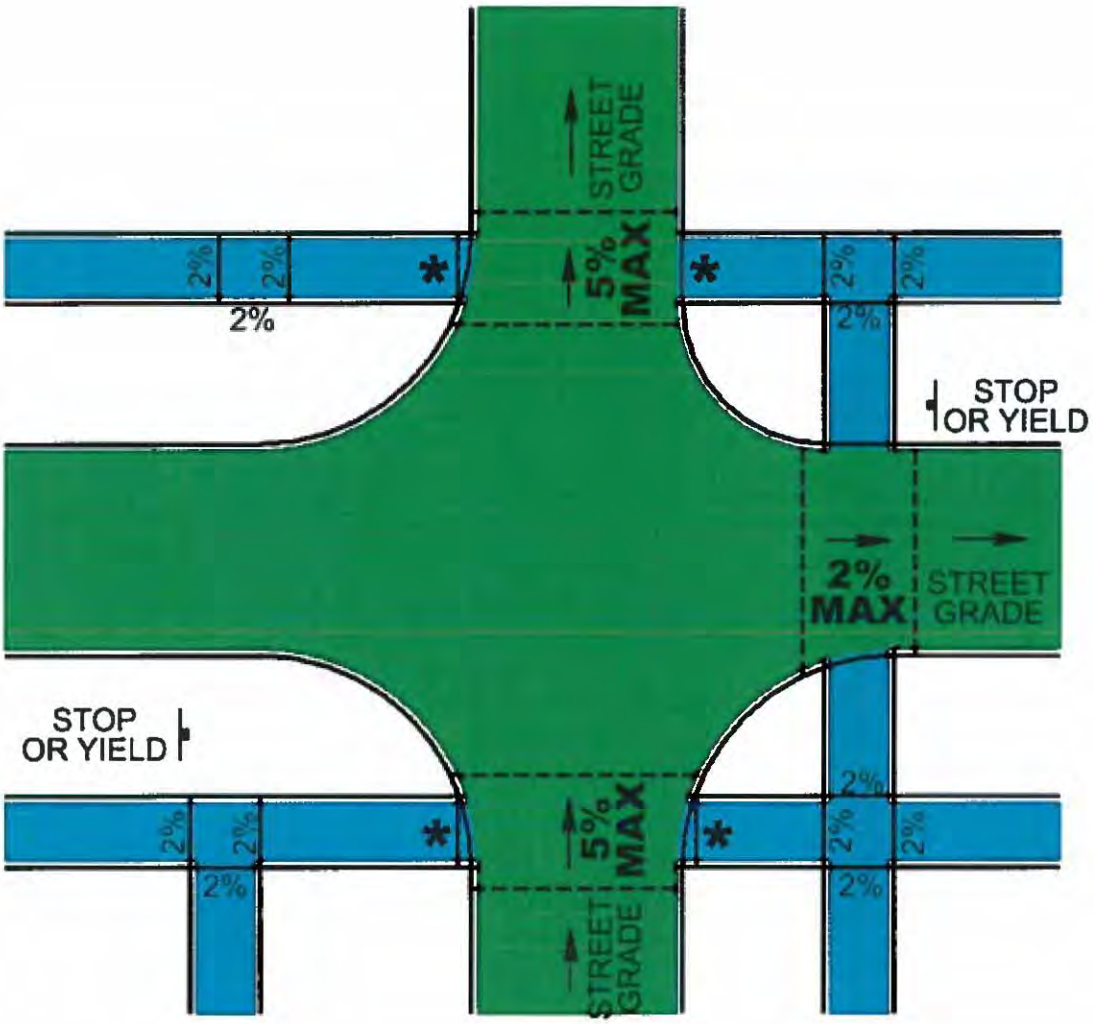


Figure 15: Street Intersection Example

6.) CROSSWALKS

Pedestrian crossings should meet the same ADA requirements as sidewalk corridors. A crosswalk is defined as "The portion of the roadway designated for pedestrians to use in crossing the street." A 2 percent or less crosswalk grade is ideal however; due to multiple overlays, the roadway cross-slope (crosswalk slope) of the street will sometimes increase past 2 percent. The two most problematic transition points occur between the street and between the gutter and the gutter and the curb ramp. The algebraic difference between the ramp leading into the crosswalk and the crosswalk itself should not exceed 13 percent. 11 percent is considered best practice. An algebraic

difference greater than 13 percent may cause damage to a wheel chair foot rest and may cause the wheel chair to tip forward or backward. If the algebraic difference exceeds 11 percent, the designer should consider providing a flat area 2 foot long at the bottom of the ramp prior to entering the crosswalk. This area may be flat, as shown in Figure 16 or may be on a slight slope to transition into the roadway cross slope.

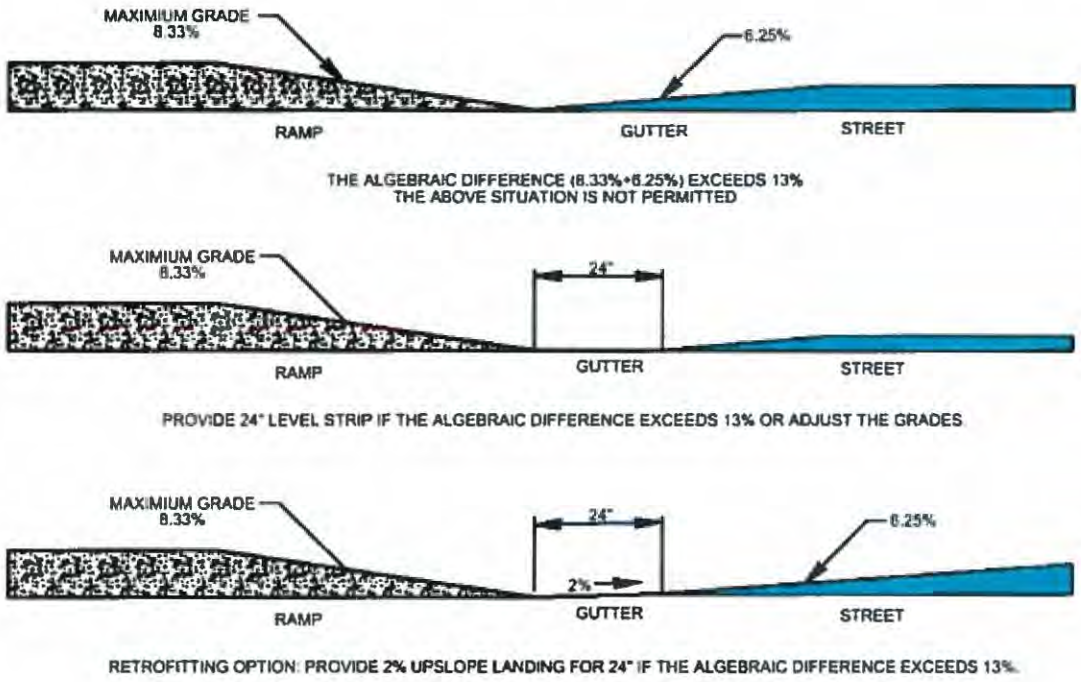


Figure 16: Counter Slope

Crosswalks, whether marked or unmarked, exist at all intersections where sidewalks are present. Crosswalks may also exist at midblock locations. Crosswalks at midblock locations should be marked, and will be discussed in more detail. Marked crosswalks are beneficial because they inform motorists and pedestrians that they are in, or are approaching, the pedestrian right-of-way. Crosswalks, wherever possible, should be lined up to form a natural extension of the sidewalk corridor.

Prohibiting pedestrian crossings on un-signalized roadway intersections are strongly advised in situations with wide crossings (4 lanes or more), speeds 30 miles per hour or greater and with signalized opportunities at reasonable distances apart. Engineering judgement and common sense should play a role in this decision. If it is deemed necessary to provide a pedestrian crossing at one of these situations, a traffic signal or pedestrian hybrid beacon should be considered based on criteria in the Pedestrian and School Traffic Control Manual.

SKEWED INTERSECTION CROSSWALKS: Skewed intersection crosswalks create operational problems for motorists as well as pedestrians. Skewed intersections increase the time pedestrians are exposed to traffic and provide unclear orientation cues for pedestrians with visual impairments. Skewed intersections may reduce sight distances for both motorists and pedestrians while encouraging higher turning speeds for many motorists.
If skewed intersections are unavoidable, then crosswalk placement at the skewed intersection becomes especially important to reduce some of the pedestrian challenges. At skewed intersections, crosswalks may be located perpendicular to the roadway or in line with the skew of the intersection. Crosswalks can also be placed somewhere in between a completely perpendicular placement and a totally skewed placement, as shown in Figure 17.

Crosswalks placed perpendicular to the roadway at skewed intersections create the shortest crossing distance for pedestrians and provide pedestrians with good visibility of approaching motorists. However, perpendicular crosswalks may be more difficult for pedestrians with visual impairments to locate. They also place pedestrians on one side of the road further from the intersection which creates an unexpected situation for motorists.

Crosswalks placed in line with the skew at skewed intersections align with the approach sidewalk. This placement leads to the longest overall walking distance for pedestrians. Pedestrians therefore are exposed to motorists for a longer period of time.

In many cases, the best placement for a crosswalk is somewhere between a completely perpendicular crosswalk and a completely skewed crosswalk. The proper crosswalk placement can be achieved by envisioning the natural path a pedestrian will take and analyzing the various turning movements to create optimal visibility, meet motorist and pedestrian expectations, and provide reasonable crossing distances.

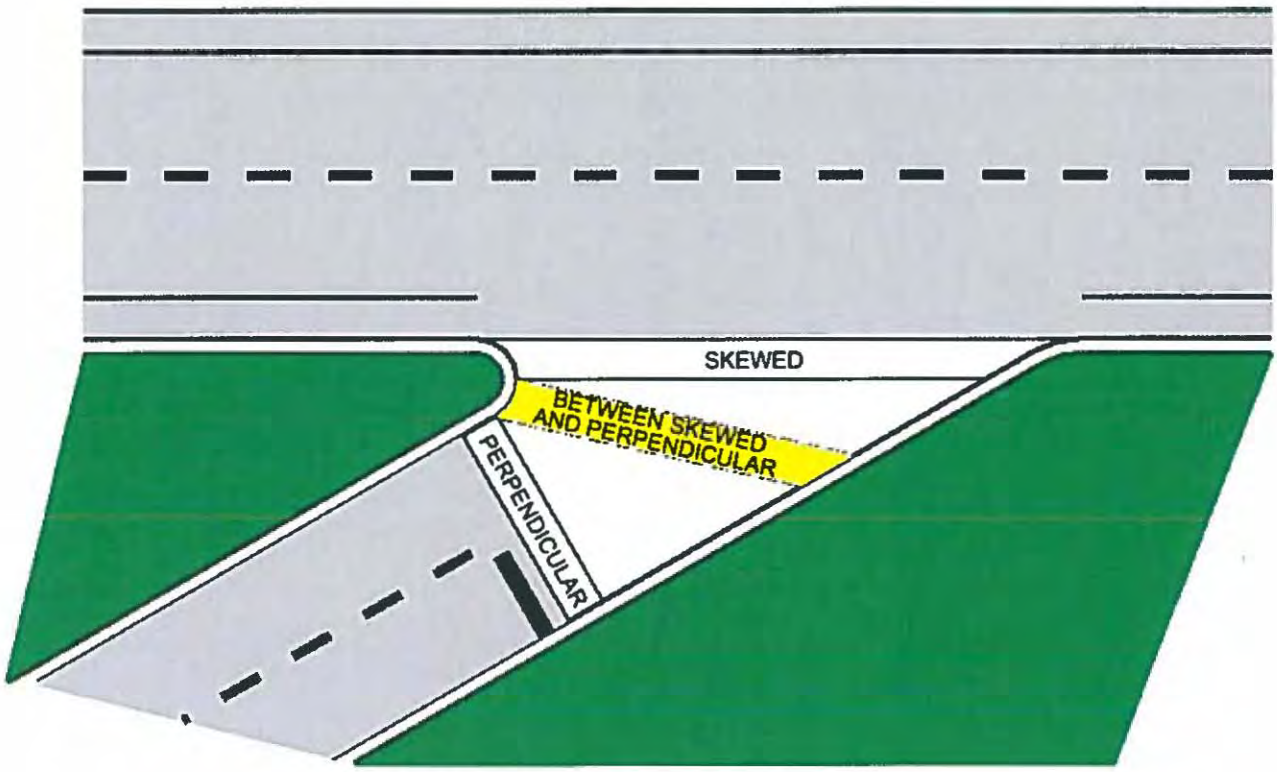


Figure 17: Skewed Street Intersection

7.) MIDBLOCK CROSSINGS

Although not as common and not as desirable as corner (intersection) crossings the same ramp slope and width criteria apply to these crossings. At midblock crossings, pedestrians with visual impairments do not have the sound of parallel traffic available to identify a midblock crossing opportunity. A traffic signal and an audible indicator that provides timing information may be considered. In certain situations curb extensions (bulb outs) can be beneficial in reducing crossing times and increasing visibility between pedestrians and motorists. Some midblock crosswalks may be raised above the road grade, to increase the pedestrians' visibility and slow vehicles. Midblock crosswalks are more appropriate on streets with long blocks or streets with alleys that cross the roadway. Midblock crosswalks should be considered where large pedestrian volumes are expected to cross the roadway or where substantial pedestrian generators are located between intersections. For example, pedestrians may need a midblock crosswalk to access stores located across the street from a university.

Curb extensions at midblock crossings help reduce crossing distance.

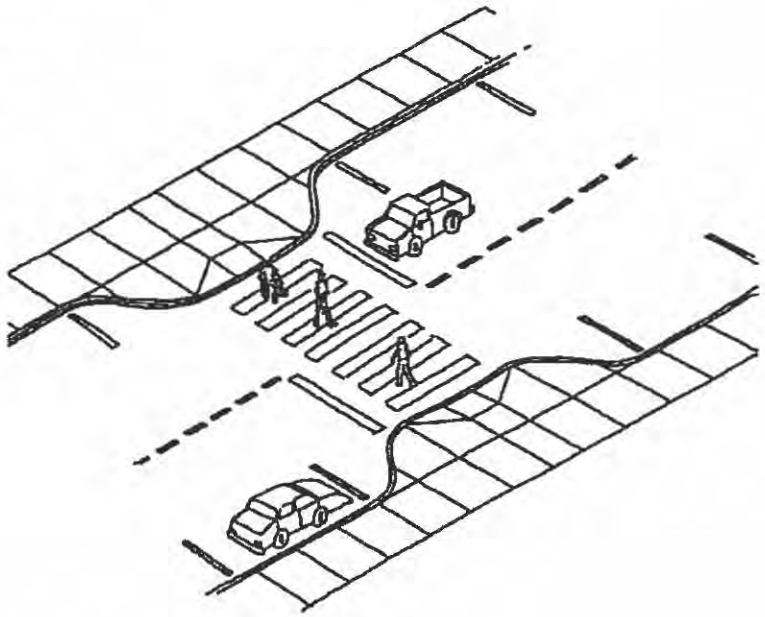


Figure 18: Midblock Crossing

At midblock crossings, the cross slope of the pedestrian street crossing is allowed to equal the street grade.

Midblock crossings should not be located where the horizontal or vertical alignment of the roadway limits drivers' or pedestrians' sight distance.

No parking is allowed within 100' of a midblock crossing unless it has a bump out.

8.) SIGHT DISTANCES:

Sight distance is the distance a person can see without any obstructions blocking their view. Sight distance at intersections may be limited to motorists and pedestrians by several items; parked cars, signs, landscaping, utility poles, traffic devices, and several others. It is important for both motorists and pedestrians to have adequate sight distance. Wheelchair pedestrians and small children have even smaller sight distances, as they cannot see over items such as benches, landscaping, trash receptacles and traffic control boxes. Whether in the initial design phase or upgrading pedestrian crossings, consideration should be given to locating or relocating some of the items that may be limiting sight distance.

Curb extensions (bulb-outs) are effective in improving sight distance, not only do they deter parking close to intersections, they also improve visibility for pedestrians, shorten crossing distances and provide a space for curb ramps and landings. Bulb-outs may not be practical everywhere but are excellent in downtown settings. Limiting parking near intersections is also a good way to improve sight distance. When checking sight distances the designer should refer to the WYDOT Pedestrian and School Traffic Control Manual. For distances that vehicles should park from crosswalks, refer to the WYDOT Pavement Marking Manual.

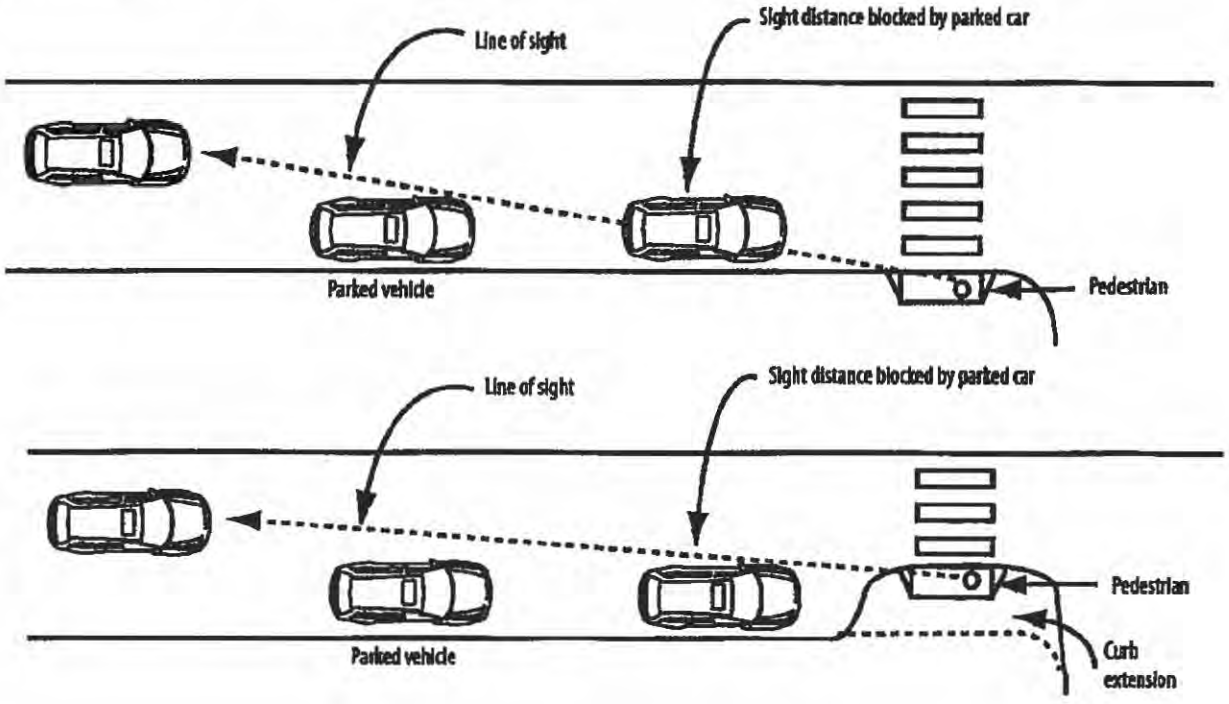


Figure 19: Sight Distance

9.) DRIVEWAYS

Where the pedestrian pathway crosses a driveway, the same width criteria apply as with standard sidewalk. The maximum cross-slope of 2 percent also applies regardless of the driveway material.

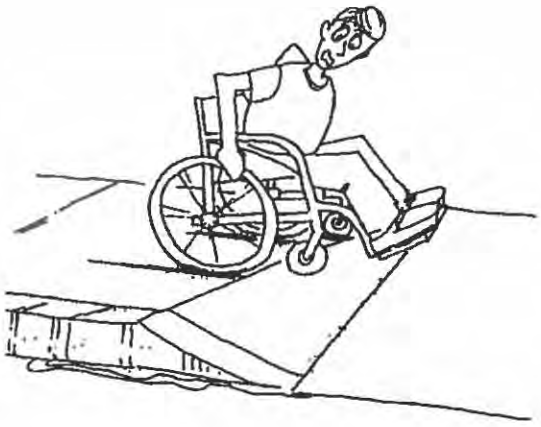
Several acceptable driveway designs are:

a.) For wide sidewalks, there may be enough room to provide a ramp for drivers and a level crossing for pedestrians.

b.) Jog the sidewalk back from the street to provide a level (4 feet wide minimum) crossing for pedestrians.

c.) For narrow sidewalks located directly behind the curb, lower driveway almost to street level and incorporate ramps in sidewalk on each side of the driveway to transition sidewalk close to street level. Although not as desirable as a.) and b.), this is acceptable.

Driveway crossings without landings confront wheelchair users with severe and rapidly changing cross-slopes at the driveway flare.

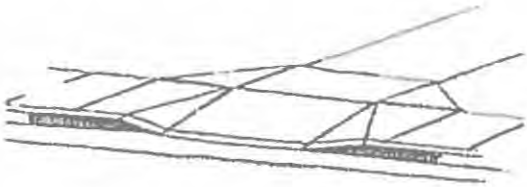


When sidewalks have a planter strip, the ramp of the driveway does not interfere with a pedestrian's path of travel.

Figure 20: Driveway Crossings

On wide sidewalks there is enough room to provide a ramp for drivers and retain a level landing for pedestrians.

Jogging the sidewalk back from the street provides a level landing for pedestrians on narrow sidewalks.



Although parallel driveway crossings provide users with level landings, users continuing on the sidewalk are forced to negotiate two ramps.

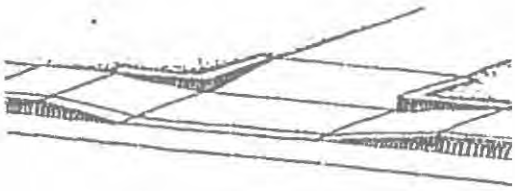


Figure 20 (Cont.): Driveway Crossings

In the last above example, the designer should pay special attention to drainage issues. Water may pond onto the sidewalk and freeze, causing a hazard. For this reason, it's not recommended to use this scenario on very flat terrain. The designer may consider a mountable (rollover) curb in this situation to raise the sidewalk enough to prevent water from flowing into the sidewalk path way and down the driveway. Keep in mind that driveway crossings are not meant as accesses for pedestrians or wheelchairs to enter the street.

10.) MEDIANS/TRAFFIC ISLANDS/FREE RIGHT TURN ISLANDS

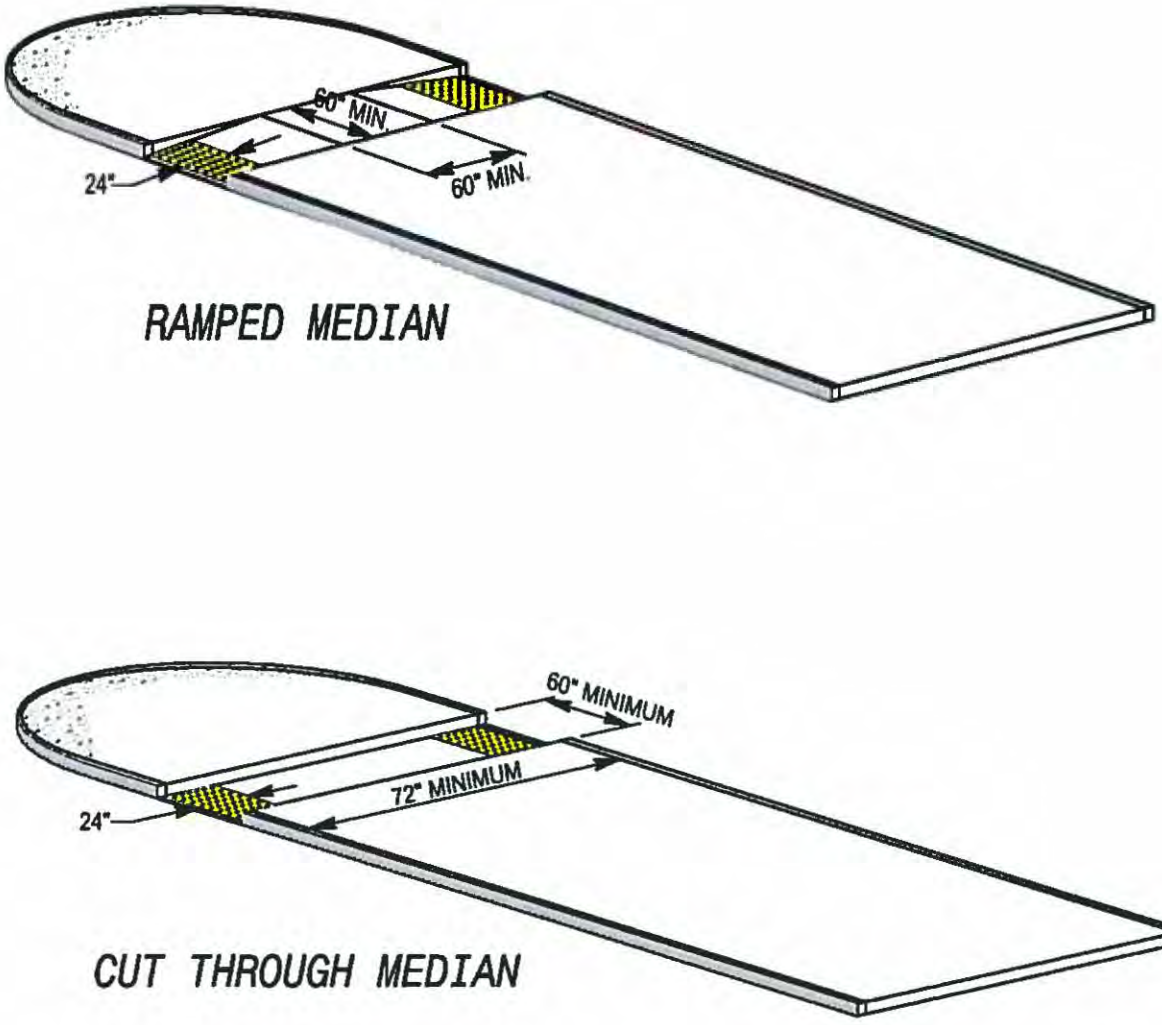


Figure 21: Medians

MEDIANS: Medians at intersections can greatly facilitate pedestrian crossings at signalized and non-signalized intersections. Medians provide a waiting area for pedestrians who are unable to completely cross the street during a single crossing phase.

When a median contains a street-level cut through, the street-level cut through should be at least 5 feet wide to allow for wheelchair passing. Maintain positive drainage away from the pedestrian crossing. If there are ramps in the median leading to a level landing, the ramp grade shall not exceed 8.3 percent. Level landings in the medians should be 5 feet by 5 feet, or the width of the cut through by 5 feet.

Street-level cut throughs and ramped median crossings should include detectable warning devices. The detectable warning devices should be separated by a minimum of 2 feet. The detectable warning devices should be the width of the cut through or ramp, with the leading edge placed at the back of curb and should extend away from the gutter by 2 feet. Medians less than 6 feet across do not require detectable warning devices.

If an adequately sized landing on the ramped cut throughs cannot be provided due to space limitations, the landing may be lowered to approximately half the height of the median curb to allow for shorter ramps. A street-level cut-through and a ramped median crossing require regular maintenance, such as sweeping and snow removal. Attention should be paid to drainage to prevent ponding water.

Newly constructed medians should not be less than 6 feet wide from face of curb to face of curb. A minimum 6-foot wide median is required to separate the pedestrian waiting area from the face of the curb and to provide ample space for multiple pedestrians, wheelchair users or bicyclists.

FREE RIGHT TURN ISLANDS: To minimize motorist-pedestrian conflicts at free right turn islands, pedestrian crosswalks should be at 90-degrees across right turn lanes. If a right turn island contains a street-level cut through, the street-level cut through should be at least 5 feet wide. If there are ramps leading to a level area, the ramps should be 5 feet wide and shall not exceed a grade of 8.3 percent. The level landing should be 5 feet wide by 5 feet long. Ramps and cut throughs should contain detectable warning devices at all locations that abut the roadway. The placement and criteria for detectable warning devices for curb ramps apply to right turn islands also.

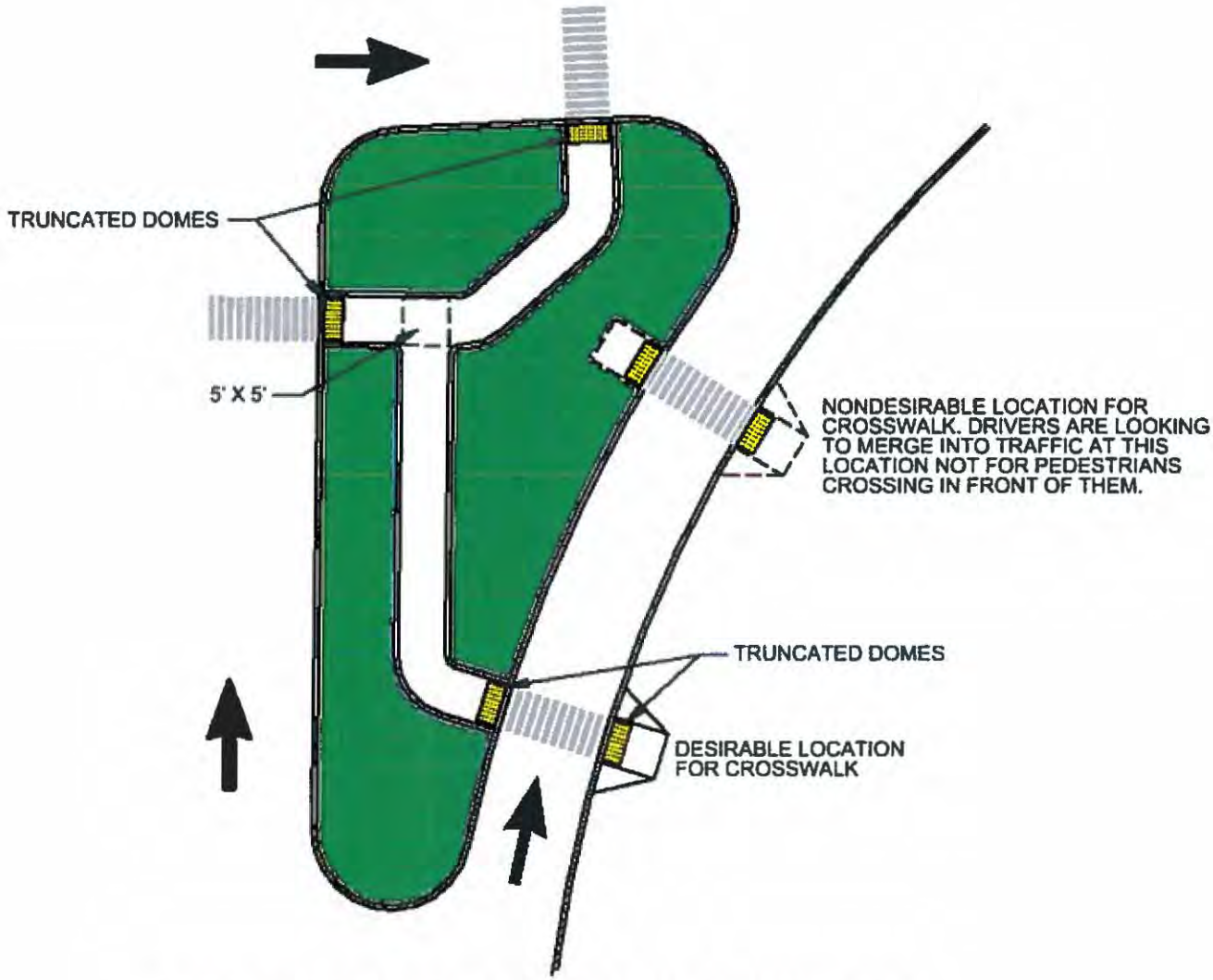


Figure 22: Free Right Turn Median

11.) ROUNDABOUTS

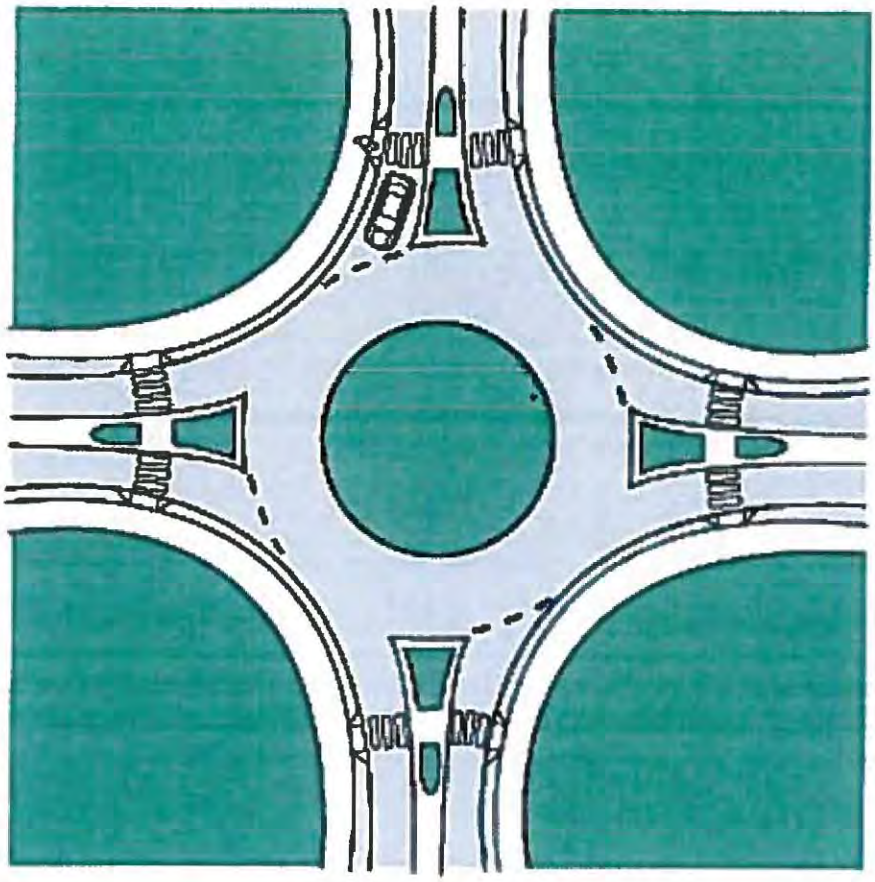


Figure 23: Roundabouts

While roundabouts have certain desirable characteristics for all users, including pedestrians in general, they can be problematic for some pedestrians. For example, because pedestrians can only cross roundabouts during gaps in traffic or upon motorists yielding to them (similar to crossing other unsignalized intersections) pedestrians may find it difficult to cross a roundabout with insufficient traffic gaps and vehicles that fail to yield.

Islands (splitter islands) located on the legs entering and exiting roundabouts must be accessible, detectable and large enough to handle pedestrian traffic, including wheelchair users. Crosswalks to these islands should be offset a minimum of 20 feet (approximately one car length) from the yield line for each of the approach intersections.

Parking should always be prohibited near roundabout entrances and exits. If parking is provided next to a roundabout, it should be set back 75 feet or more from the yield line.

Multi-lane roundabouts usually have slightly higher speeds than single-lane roundabouts, as well as longer crossing distances for pedestrians. As a result, these roundabouts often create more problems for pedestrians. Even the best roundabouts, however, pose a special problem for pedestrians who are blind or have a disability. Unlike at a traffic light, vehicles in roundabouts never come to a complete stop, and pedestrians must instead rely on timing gaps between traffic. This is tricky for those with visual impairments or those who are unable to cross quickly.

Many DOT's have installed or are experimenting with a signal referred to as HAWK (High-intensity Activated CrossWalK). The HAWK signal is activated by a pedestrian push button. When activated, the overhead signal advances through five phases:

1.) Flashing yellow to gain the attention of motorists.

2.) Solid yellow to advise drivers to prepare to stop.

3.) Solid red, which required drivers to stop before the crosswalk. During this phase, the pedestrian is shown a "Walk" indicator.

4.) Alternating red signal during which the driver may proceed through the intersection after having come to a complete stop and the pedestrian has safely crossed. During this phase, the pedestrian is shown a flashing "Don't Walk" with a countdown time that indicates the time left to cross during this phase.

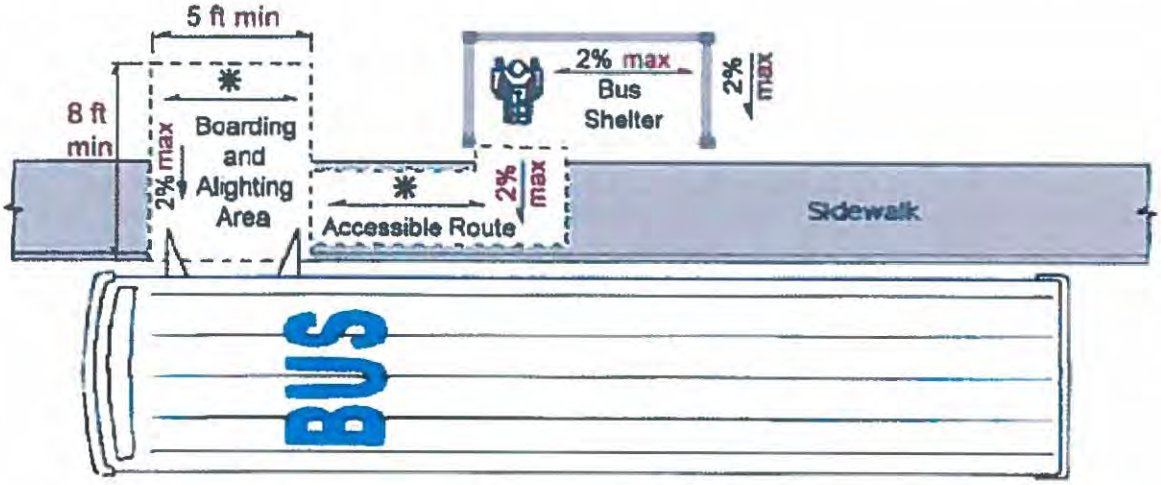
5.) At the completion of stage 4, the signal turns off and traffic may again move freely.

Figure 24: Crosswalk Signal (HAWK)

12.) BUS STOPS/WAITING AREAS

Bus stop areas should be a minimum clear length of 8 feet deep (measured perpendicular to the curb or roadway edge) by 5 feet wide minimum (measured parallel to the roadway)

If a shelter is provided, the free area within the shelter for wheelchairs should be 3 feet by 4 feet if constrained on three sides (otherwise, 2.5 feet by 4 feet minimum). These areas should all be connected to a pathway or sidewalk.



* Slope may be the same as the roadway

Figure 25: Bus Stop

13.) PEDESTRIAN ACCESSIBLE SIGNALS

Pedestrian accessible signal locations will be determined by the WYDOT Traffic Program. The designer will be responsible for coordinating with the Traffic Program regarding the ramp crossing location in relation to the pole location, pedestrian accessible signals and signal buttons. Where pedestrian actuated signals are provided, they must be made accessible.

Pedestrian pushbuttons: 1) Should be unobstructed and adjacent to a level all-weather surface; 2) Should provide an accessible wheelchair route from pushbutton to curb ramp; 3) Should be installed between the edge of the sidewalk line (extended) farthest

from the center of the intersection and the side of a curb ramp, but no greater than 5 feet from said crosswalk line; 4) Should be mounted with the face of the pushbutton parallel to the crosswalk to be used; 5) Should be 10 feet maximum to the back-of-curb at the bottom of the ramp; 6) Should be within a 10 inches horizontal reach.

Where two pushbuttons are provided on the same corner, pushbuttons should be separated by a minimum of 10 feet.

14.) PEDESTRIAN ACCESS DURING CONSTRUCTION/ PEDESTRIAN DETOURS IN WORK ZONES

Where an existing pedestrian route is disturbed by construction activities, all pedestrians, including those with disabilities, shall be provided with a reasonably safe, convenient and ADA compliant accessible alternative path. Advance notification of sidewalk closures should be provided. The pedestrian detour should provide a level of accessibility equal to the route being detoured from.

Consideration should be made to separate pedestrians from both worksite activities, and vehicular traffic. Unless an acceptable route that does not involve crossing the roadway can be provided, pedestrians should be appropriately directed with advance signing that encourages them to cross to the opposite side of the roadway. In urban and suburban areas with high vehicular traffic volumes, these signs should be placed at intersections (rather than midblock locations) so that pedestrians are not confronted with midblock worksites that may encourage them to attempt skirting the worksite or making a midblock crossing.

To accommodate the needs of pedestrians, including those with disabilities, the following considerations should be addressed when temporary alternate pedestrian access routes are designed or modified:

A.) Provisions for continuity of accessible paths for pedestrians should be incorporated into the temporary traffic control plan.
B.) Access to transit stops should be maintained.
C.) A smooth, continuous hard surface should be provided throughout the entire length of the temporary pedestrian facility. There should be no curbs or abrupt changes in grade or terrain that could cause tripping or be a barrier to wheelchair use.
D.) The width of the existing pedestrian facility should be provided for the temporary facility if practical. Traffic control devices and other construction materials and features should not intrude into the usable width of the sidewalk, temporary pathway,

or other pedestrian facility. When it is not possible to maintain a minimum width of 5 feet throughout the entire length of the pedestrian pathway, a 5 foot x 5 foot passing space should be provided at least every 200 feet to allow individuals in wheelchairs to pass.

E.) Construction sites should include temporary ramps with no lips or gaps in transition areas.

F.) The construction area should be blocked off with a cane detectable barrier or solid fencing a minimum of 36 inches in height. Plastic construction tape is not detectable by the visually impaired.

G.) Continued inspection and maintenance of the temporary access route should be part of the construction contract.

H.) A paragraph in the "Construction Requirements" special provision requiring the contractor to provide an alternative ADA acceptable pedestrian route anytime the existing sidewalk is interrupted may be a good practice. A pedestrian access route detour plan submitted by the contractor and approved by the Resident Engineer may also be a benefit.

15.) RETROFITS:

The primary purpose of most WYDOT Preservation projects on urban streets is to replace a badly deteriorated roadway surface by methods such as milling and overlaying the existing plant mix pavement, by full depth reclamation or cold in-place recycling of the existing plant mix pavement and base material, etc.

On WYDOT Preservation projects that fall into the ADA alteration category, ADA-compliant facilities should be constructed on the corners of all intersections to make the street and side streets fully accessible to disabled individuals.

However, WYDOT considers making major ADA-related improvements to the street and side streets beyond the intersection corner areas to be beyond the scope of work for an urban Preservation project. All concerned parties involved in the decision making process (from District, from Highway Development, etc.) are professionally responsible for the decision to not make the entire intersection area accessible for disabled individuals.

A new sidewalk, even when constructed as an alteration, must be designed to conform to accessibility standards to the maximum extent feasible. If reasonable care can be demonstrated, then accessible design carries no more risks for public agencies than the design of other roadway features. Careful documentation of improvements and retrofits may go a long way in discussions with users or, if necessary, in court.

All proposed retrofit layouts should be field verified prior to construction for potential conflicts with existing obstacles such as grates, electrical pull boxes, power poles, etc.

CURB RAMP GRADE EXCEPTION: Usually for retrofit situations. When "chasing a grade," the ramp length need not exceed 15 feet; however, slope must be uniform. Using the maximum 15 feet does not necessarily determine the maximum extent feasible, and if a compliant running slope can be achieved by a distance slightly greater than 15 feet, this should be considered. Engineering judgement would be the key in this situation. Generally speaking, the recommendation would be to round up to the next sidewalk joint when determining removal limits to ensure the desired running slope can be achieved in construction.

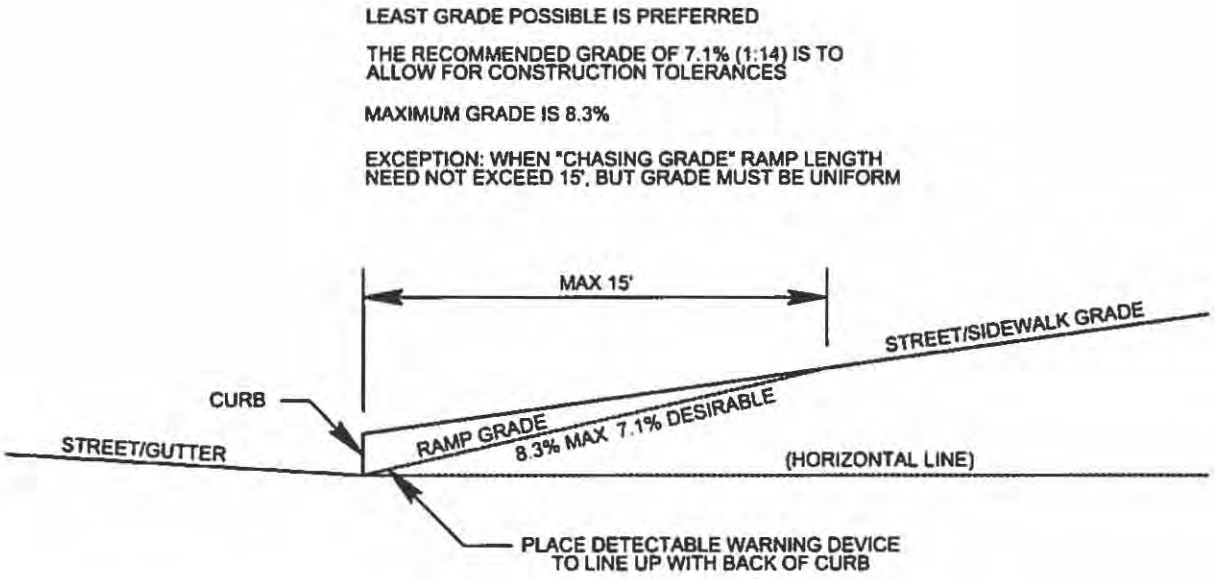


Figure 26: Curb Ramp Grade Retrofit

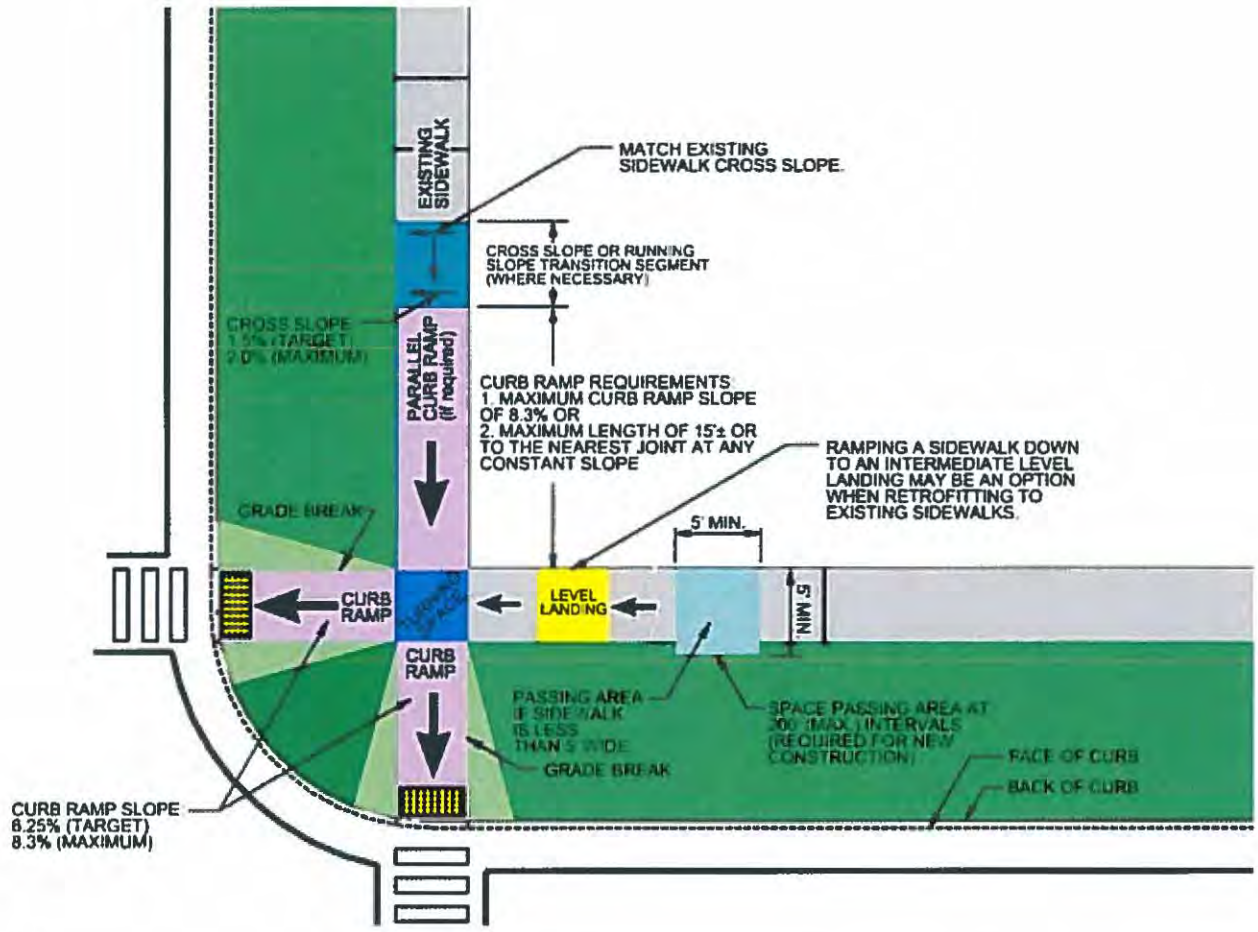


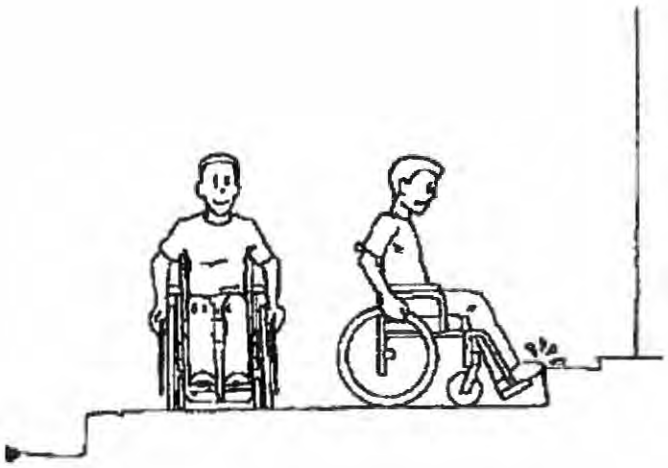
Figure 27: Retrofit Example

When correcting cross slopes, there are several options a designer may want to consider:

1.) Several common problems may be seen in Figure 28 "A" and "B". Solutions are shown in the following examples.
2.) Can the existing sidewalk be divided lengthways into conforming and nonconforming widths. The nonconforming widths may be used to transition down to curb, as shown in Figure 28 "C".
3.) If furniture and frontage zones exist their slopes may be steepened to help flatten the sidewalk slope, as shown in Figure 28 "C".
4.) The entire sidewalk may be raised along the curb with steps at the curb if there is parking. Curbs higher than 6 inches can cause parking issues (car doors can't be opened), as shown in Figure 28 "D".
5.) A combination of the above scenarios may be the best solution.

Stairs bridging low street elevation and high finished-floor elevation prevent wheelchair access into the building.

"A"



Steep cross-slopes bridging low street elevation and high finished-floor elevation make the sidewalk difficult for wheelchair users to travel across.

"B"

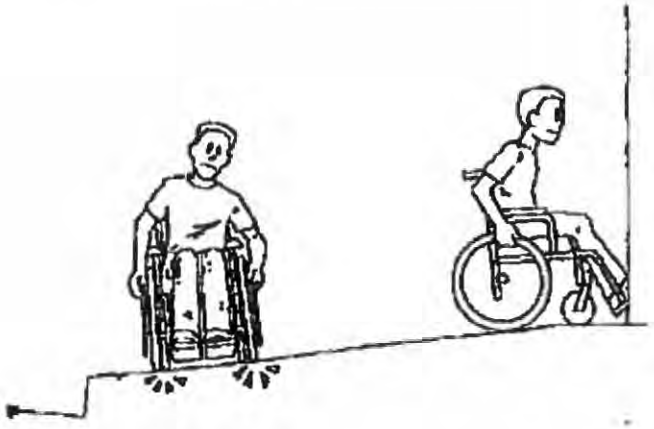
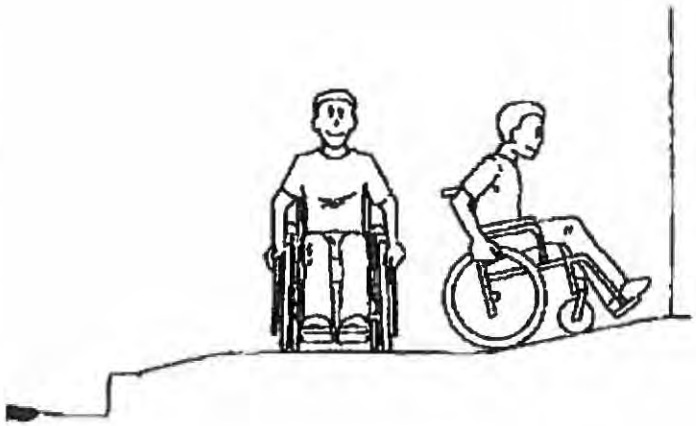


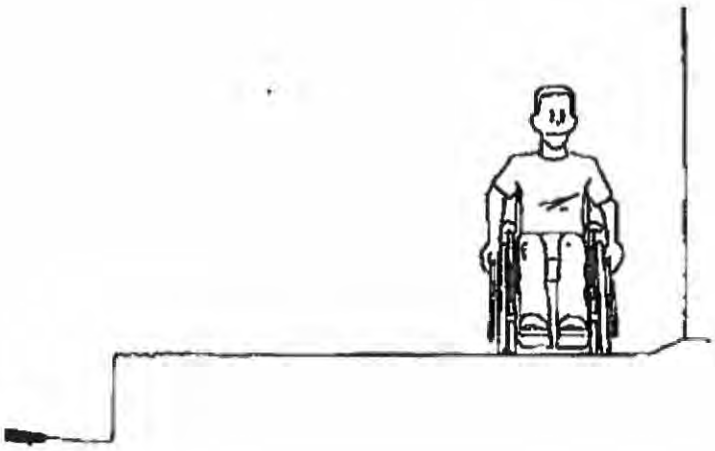
Figure 28: Retrofit Sidewalk to Building Entrance

A level area at least 1.2192 m (48 in min.) wide improves access when there is a low street elevation and high finished-floor elevation.



"C"

A higher curb provides a level pathway but might increase the slope of curb ramps if the sidewalk is narrow.



"D"

Figure 28 (Cont.): Retrofit Sidewalk to Building Entrance

When retrofitting narrow sidewalks with accessible curb ramps, designers may want to consider several options:

1. Add curb extensions (bulb outs) to allow more room to add compliant ramps and reduce street crossing distance, as shown in Figure 10.
2. Widen the sidewalk to allow for ramp landings by securing additional right of way from adjacent property owners or by narrowing driving lanes and adding width to sidewalk.
3. Install parallel curb ramps. These can allow for longer ramps if required, as shown in Figure 33.

4. High curb situations install a combined parallel and perpendicular curb ramp. The parallel ramp may lower the sidewalk and curb to a point where the perpendicular ramp length may be significantly reduced, as shown in Figure 29.
5. Manipulate the curb height for a short distance on either side of the ramp. This may reduce the required ramp length to allow a full size landing. It should be noted that the curb height should not be reduced more than 3 inches as the gutter may over flow onto the sidewalk during heavy rains. Four inch high curb would be more desirable. Drainage should be closely examined with possible inlets added at strategic locations, as shown in Figure 34.

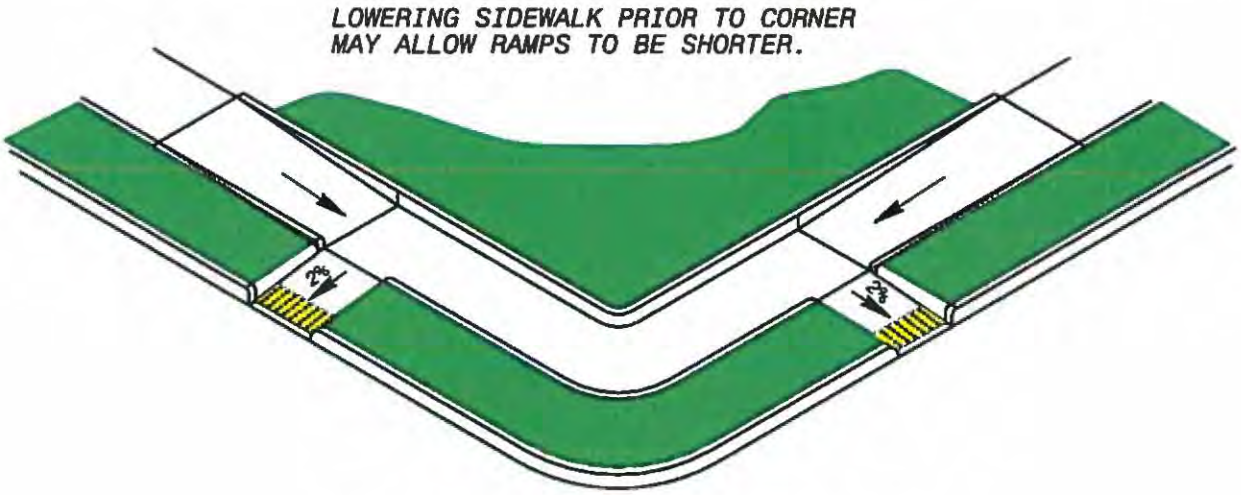


Figure 29: Lowering sidewalk in advance of ramp.

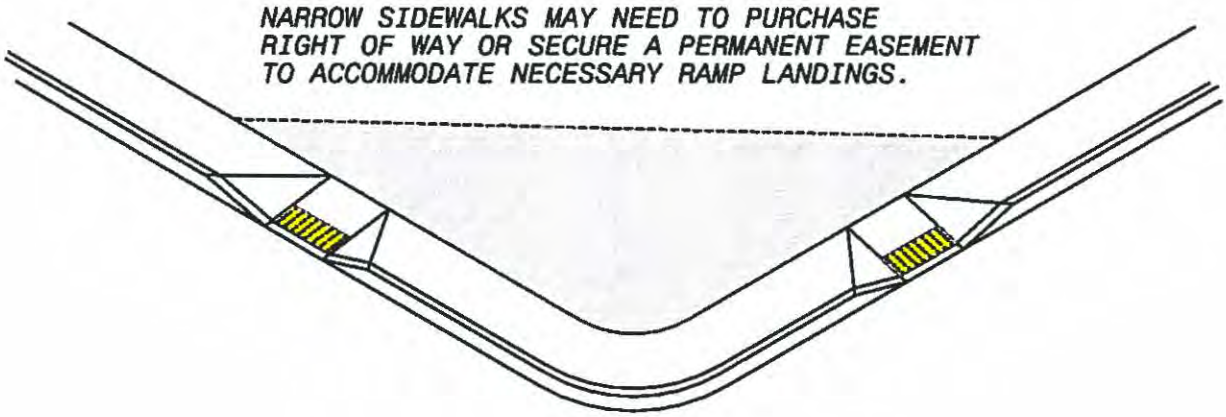
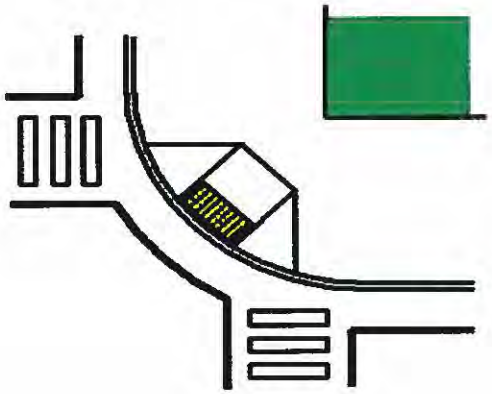
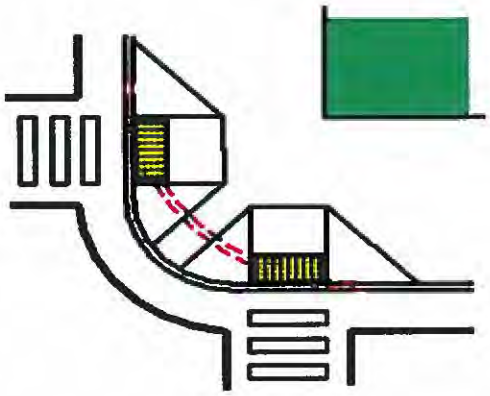


Figure 30: Secure additional property.



BEFORE



AFTER

REDUCE CURB RADIUS TO ALLOW SPACE FOR TWO PERPENDICULAR CURB RAMPS

Figure 31: Modify curb radius.

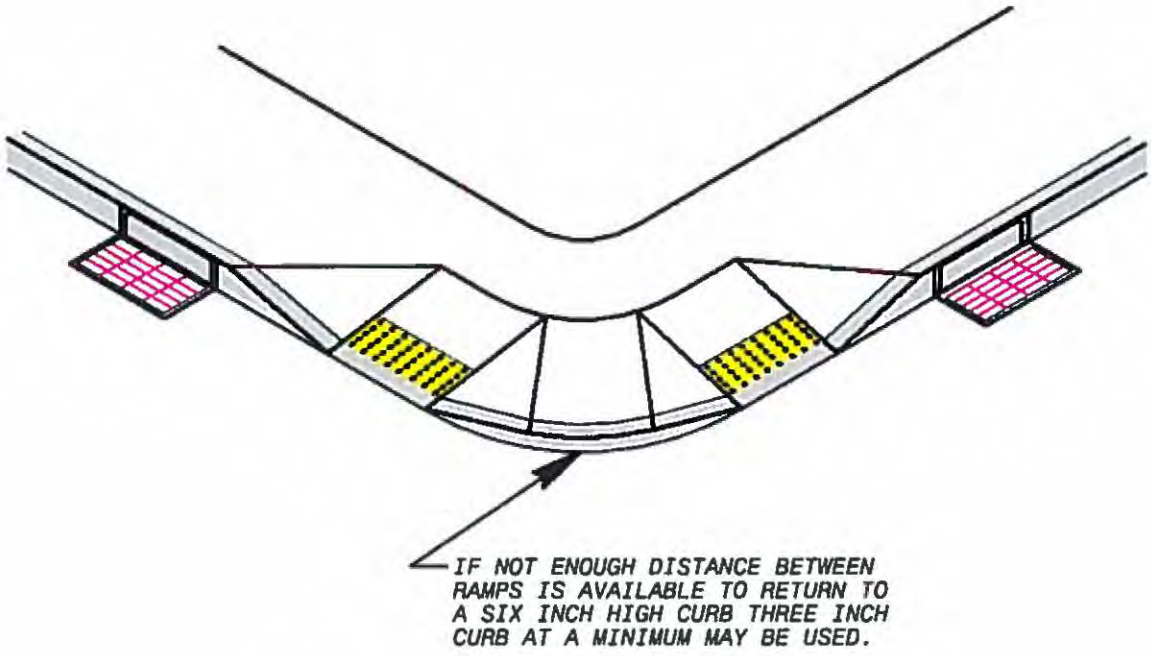


Figure 32: Lower curb between ramps.

When two parallel or flared curb ramps are situated close together at an intersection you may not need to return the curb height between them to a full 6 inches. You may go to a 3 inch curb minimum (4 inches desirable) but beware of drainage problems. This works best on areas that are not too flat.

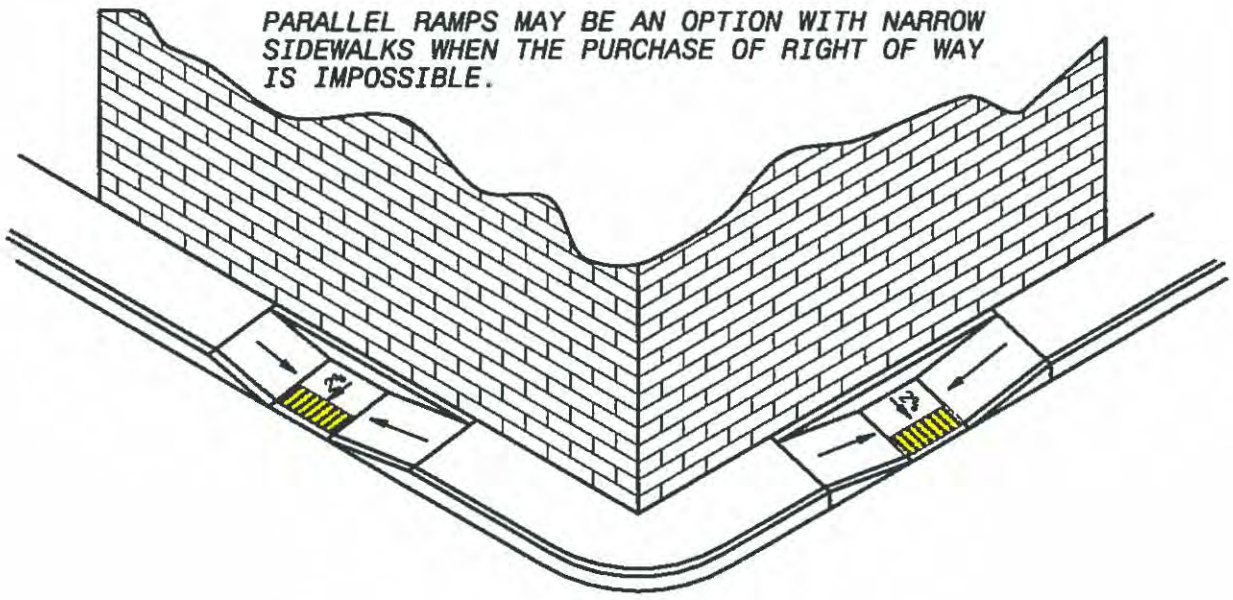


Figure 33: Parallel ramp option.

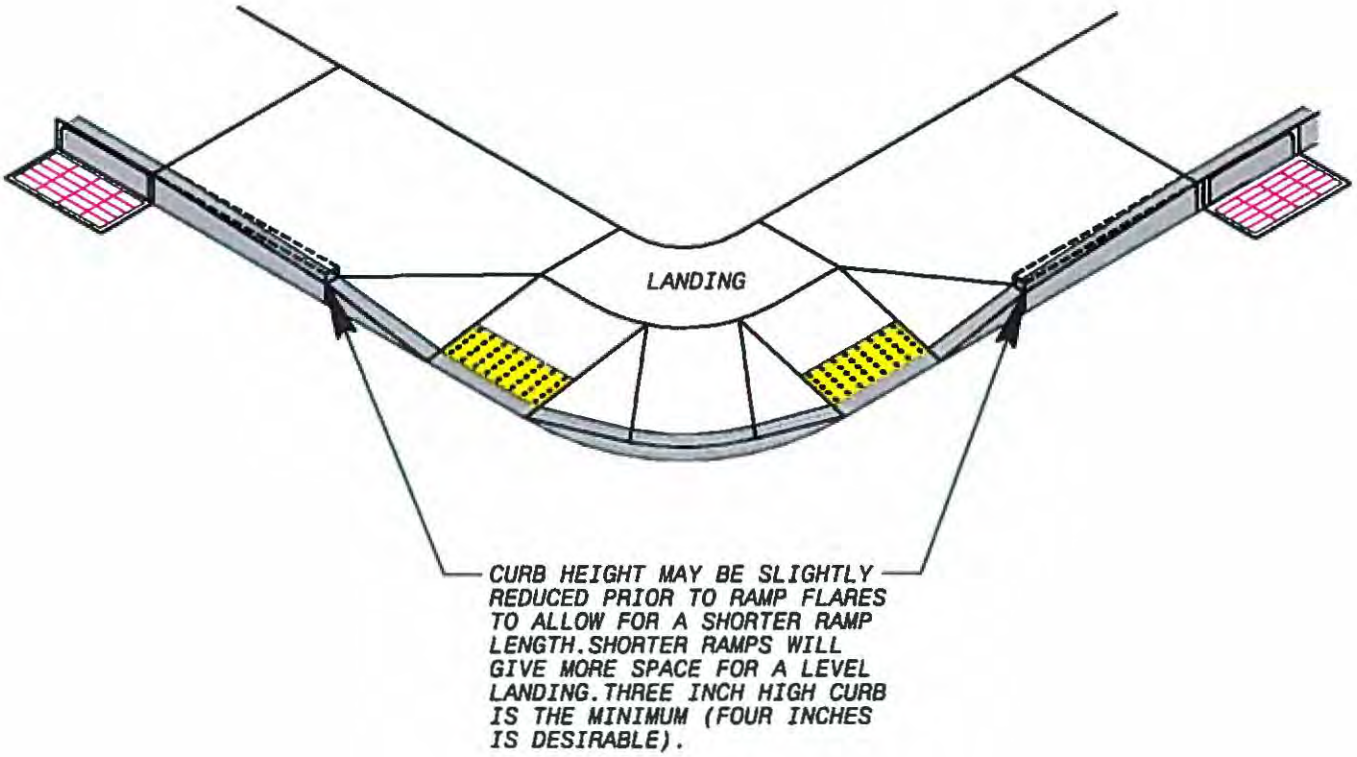


Figure 34: Reduced curb height.

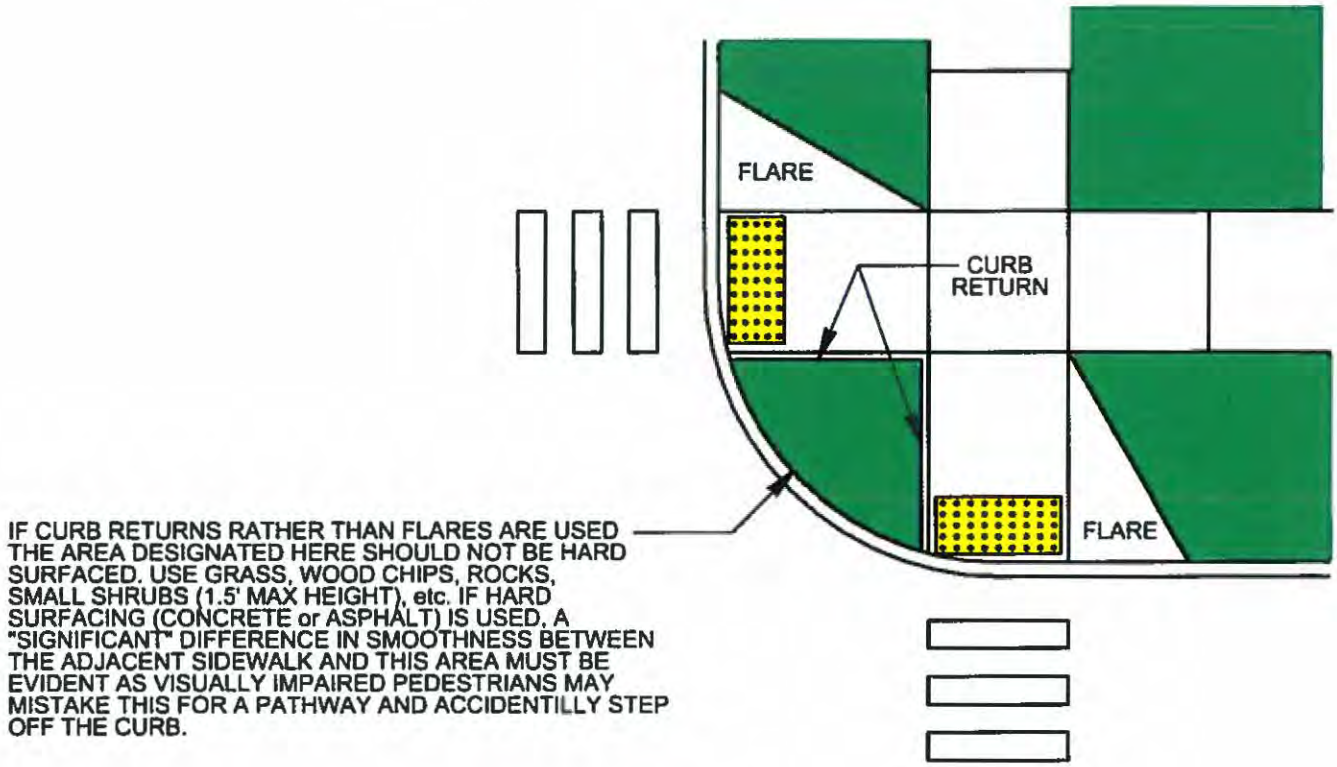


Figure 35: Curb Returns

Little has been mentioned regarding crosswalks when retrofitting wheelchair ramps to existing situations. The designer should be cognizant of the condition of the asphalt located between wheelchair ramps, as shown in Figure 36. Badly deteriorated, rutted or warped asphalt should be replaced, as wheelchairs will have a difficult time negotiating the crosswalk. Double gutter may be extended back to the outside edge of the crosswalk or asphalt may be replaced to the same location.

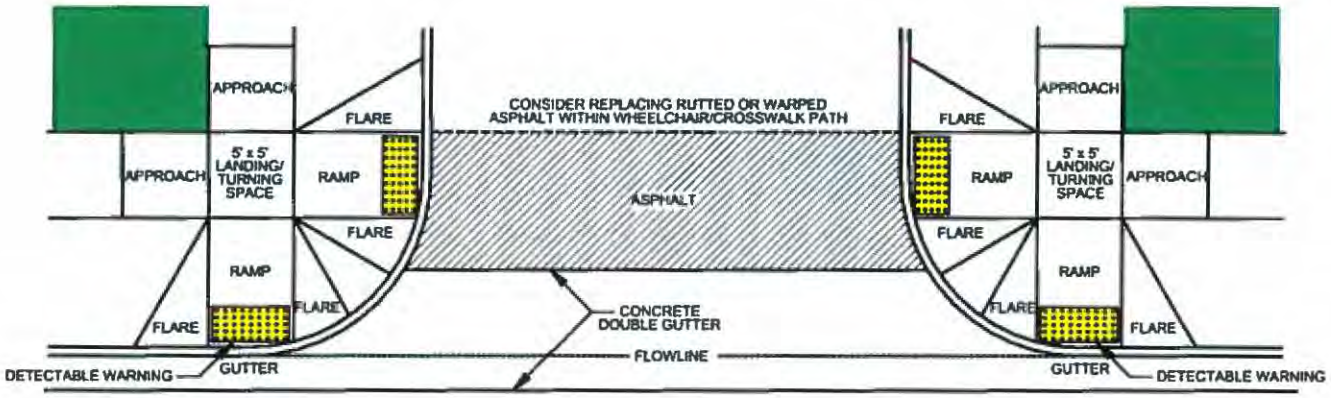


Figure 36: Crosswalk Repair

16.) MAINTENANCE

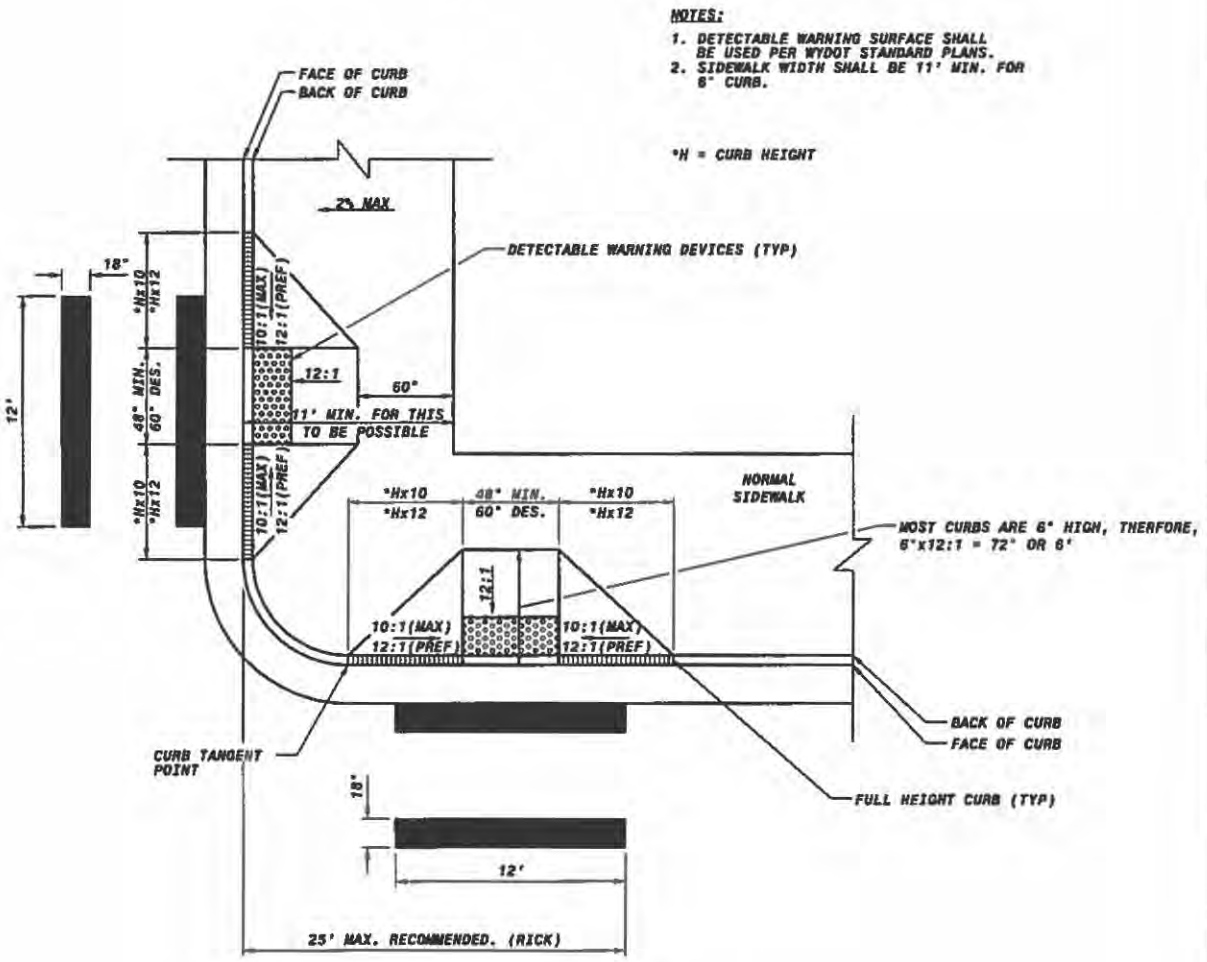
Sidewalks are prone to damage caused by environmental conditions. Maintaining sidewalk elements in good condition is an essential part of providing access to public rights-of-way. Sidewalks in poor repair can limit access and threaten the health and safety of pedestrians. If sidewalks are in poor condition or nonexistent, pedestrians are forced to travel in the street. The designer should consider maintenance issues that could occur due to the design and strive to design as maintenance free installations as feasible.

17.) RIGHT-OF-WAY

Presently, policy regarding the purchase of right-of-way to accommodate ADA facilities, sidewalk and driveways is not available. A general guideline the designer may practice follows: ADA facilities and sidewalk proposed to be constructed outside the existing right-of-way should be purchased with new right-of-way. ADA facilities are usually located at street corners that will not be relocated. ADA facilities and sidewalk will generally be maintained by the city or WYDOT. Driveways are more inclined to be relocated due to business remodels or new business development. If right-of-way is purchased versus a construction permit, if at a future date a remodel occurs there may be jogs in the right-of-way for no apparent reason. Construction permits are in most cases considered acceptable for driveways.

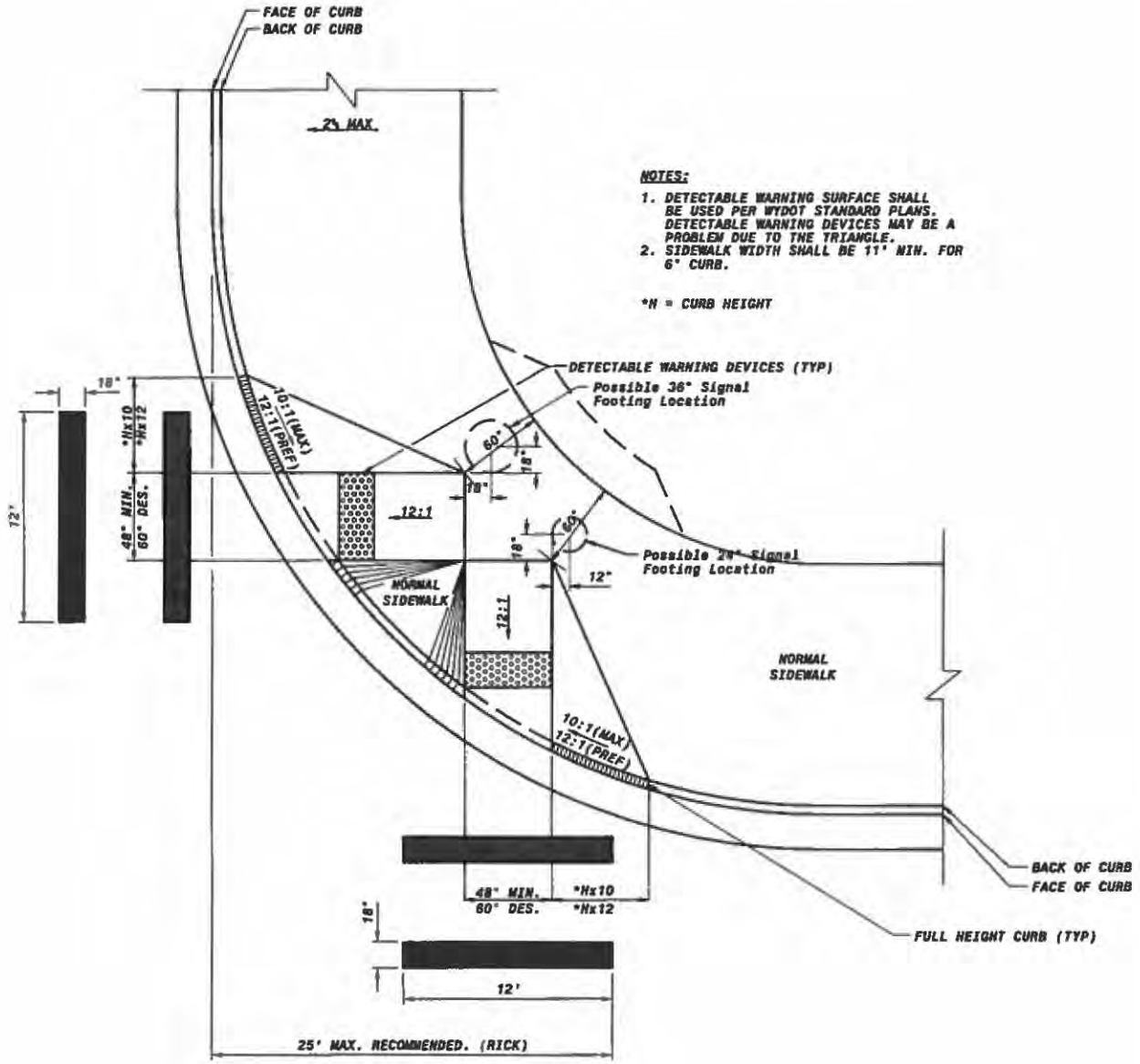
EXAMPLES

PAIRED PERPENDICULAR RAMP WITH OPTIMAL SEPARATION ON SHORT RADIUS
CURB RADIUS = 5'



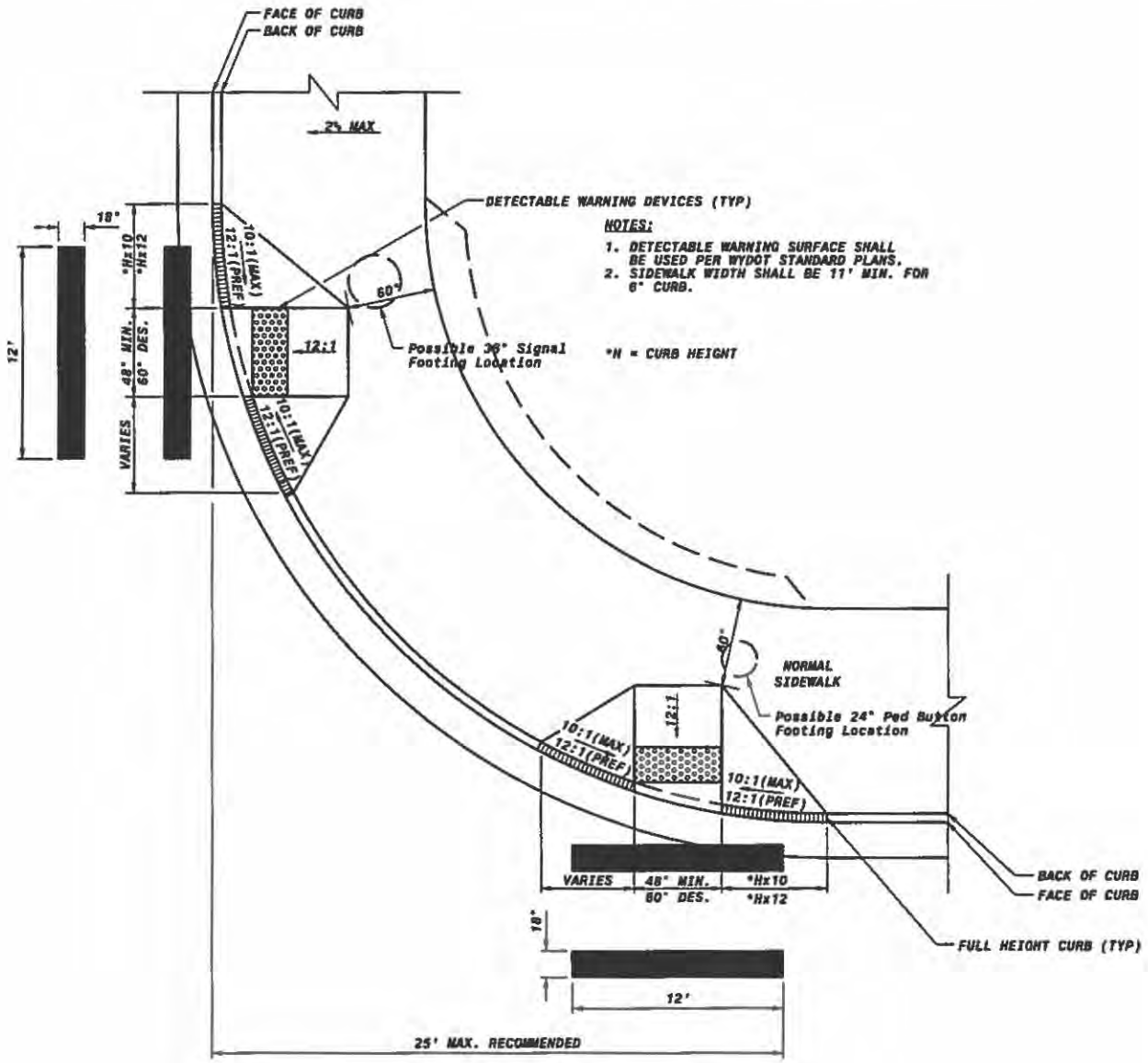
THIS IS THE PREFERRED CURB RAMP CONFIGURATION WHEN RADIUS IS = 5'.
APPLICATIONS FOR THIS DETAIL INCLUDE URBAN AND SUBURBAN INTERSECTIONS WITH SHARP CURB RETURNS AND WIDE SIDEWALKS THAT ALLOW A PAIR OF PERPENDICULAR RAMPS TO BE BUILT ACCORDING TO WYDOT STANDARDS WHILE MAINTAINING MINIMUM SIDEWALK CLEARANCES AND LANDING AREAS. PEDESTRIANS USING THE RAMP WILL ENTER THE ROADWAY PERPENDICULAR TO THE CURB AND THEREFORE THIS DETAIL IS OPTIMAL FOR LOCATIONS WHERE THE CROSSWALK IS PLACED AT A RIGHT ANGLE TO TRAFFIC. THE LOCATION OF THE RAMP, AS SHOWN IN THIS DETAIL, IS BASED ON DEVELOPING FLARES FROM THE TANGENT POINT. USE OF THIS DETAIL IS APPROPRIATE AT NON-SIGNALIZED INTERSECTIONS, SINCE THE SETBACK OF THE RAMP FROM THE CROSSING ROADWAY ALLOWS A STOP BAR BE INSTALLED RELATIVELY CLOSE TO THE INTERSECTION, THEREBY ENHANCING SIGHT DISTANCE FOR STOPPED TRAFFIC.
FLARE SLOPES ARE SHOWN AS 10:1 MAXIMUM WITH 12:1 PREFERRED.THIS ALLOWS FOR CONSTRUCTION TOLERANCES AND SNOW AND ICY CONDITIONS.

PAIRED PERPENDICULAR RAMP WITH MINIMAL SEPARATION ON LONG RADIUS
CURB RADIUS = 35'



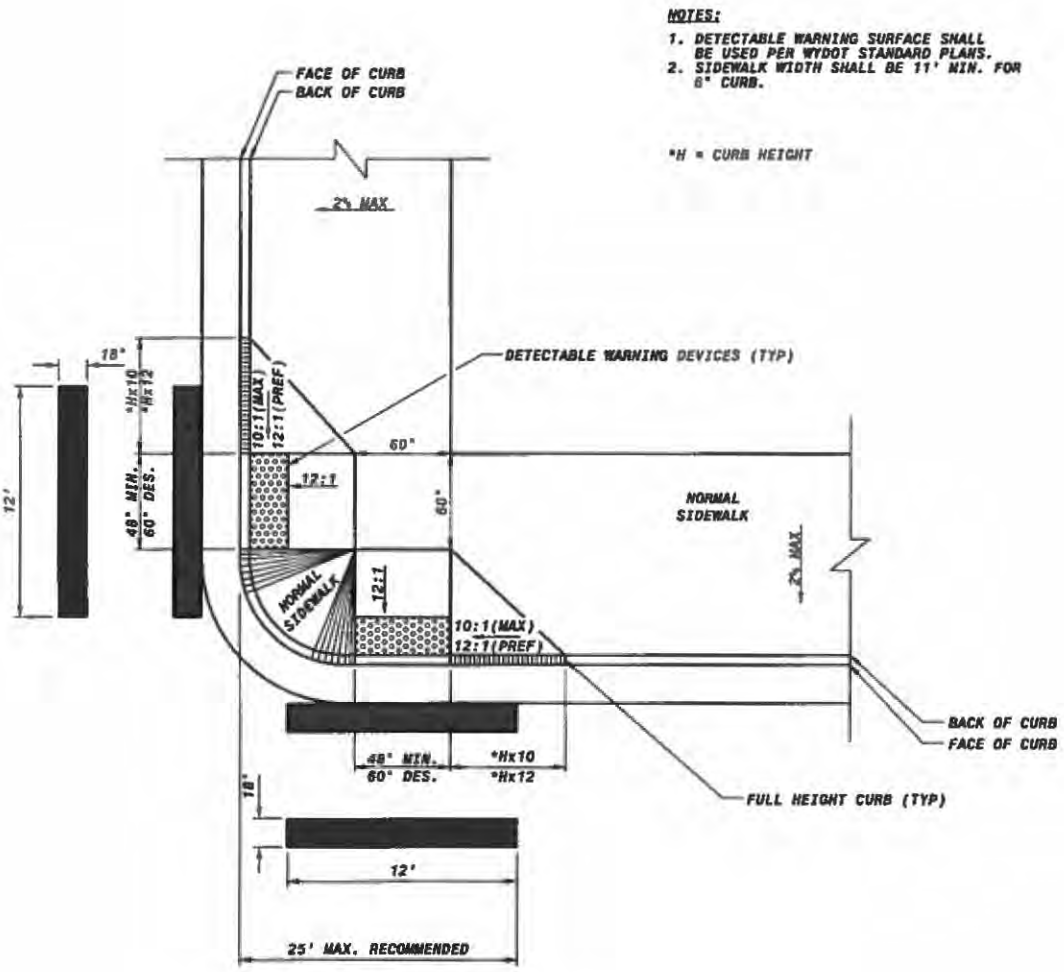
IDEAL APPLICATIONS FOR THIS DETAIL ARE SUBURBAN INTERSECTIONS WITH LARGE CURB RADII AND WIDE SIDEWALKS WHERE IT IS IMPORTANT TO MAINTAIN CLOSE PLACEMENT OF THE STOP BAR TO THE INTERSECTION AND FOR THE RAMP TO BE PROPERLY ALIGNED WITH THE CROSSWALK. MINIMUM SIDEWALK CLEARANCES AND LANDING AREAS ARE MAINTAINED. THE DESIGN DOES NOT INTERSECT THE BACK OF THE CURB BUT IS USEFUL IN AREAS WHERE THERE ARE CONSTRAINTS SUCH AS UTILITY POLES, SIGNS, FIRE HYDRANTS ETC. FORCE THE RAMPS CLOSE TOGETHER. CONSIDERATION SHOULD BE GIVEN TO THE ADDITIONAL LENGTH OF THE CROSSING RESULTING FROM THE SETBACKS FROM TRAFFIC LANES IN SIGNALIZED APPLICATIONS. PLACE THE DETECTABLE WARNING DEVICE TO MINIMIZE THE TRIANGLE OR USE SPECIAL SHAPED DEVICES. FLARE SLOPES ARE SHOWN AS 10:1 MAXIMUM WITH 12:1 PREFERRED. THIS ALLOWS FOR CONSTRUCTION TOLERANCES AND SNOW AND ICY CONDITIONS.

PAIRED PERPENDICULAR RAMP WITH OPTIMAL SEPARATION ON LONG RADIUS
CURB RADIUS = 35'



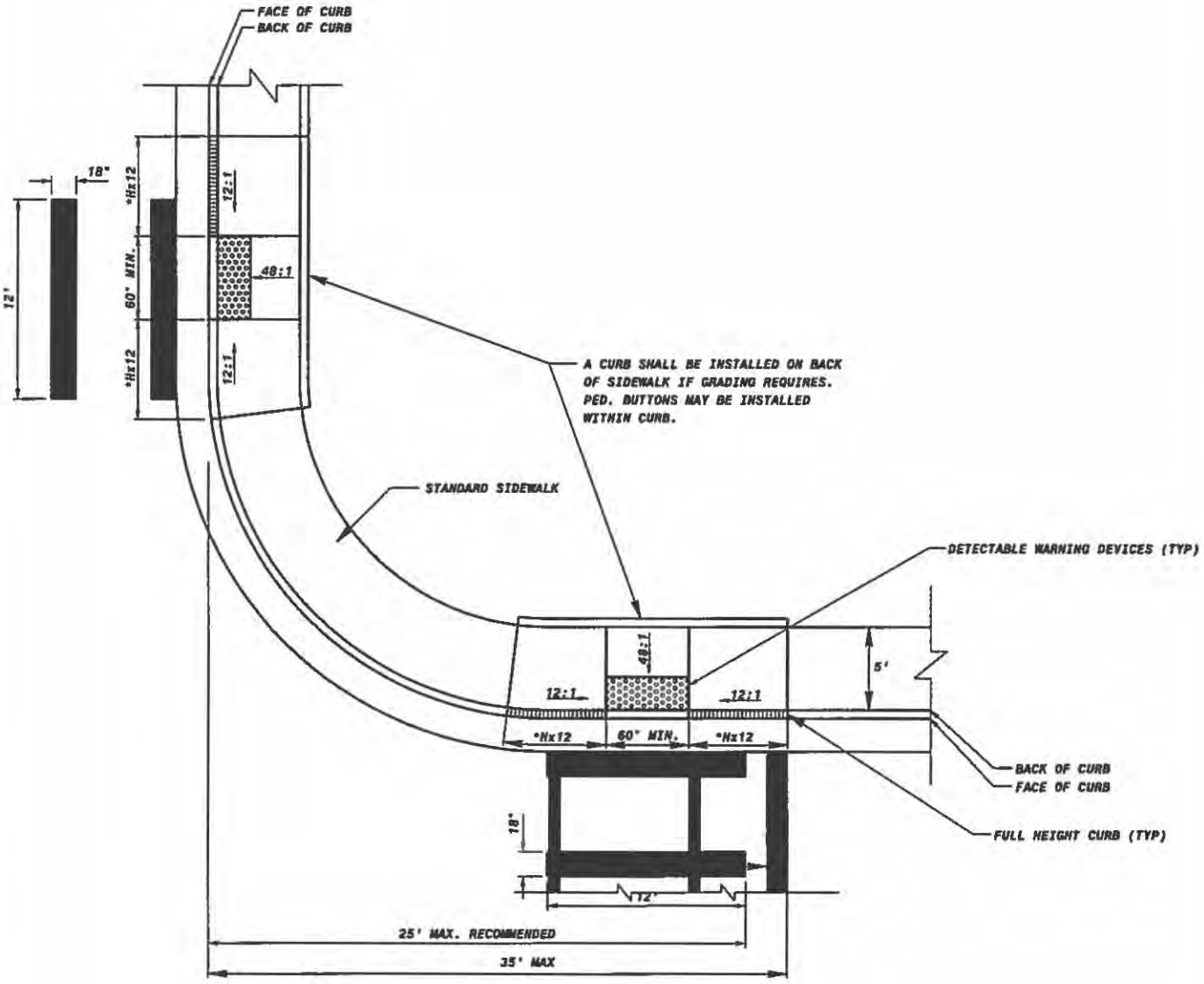
APPLICATIONS FOR THIS DETAIL INCLUDE SUBURBAN INTERSECTIONS WITH LARGE CURB RADII AND WIDE SIDEWALKS WHERE CLOSE PLACEMENT OF THE STOP BAR TO THE INTERSECTION IS NOT A HIGH PRIORITY,SUCH AS SIGNALIZED INTERSECTIONS WITH LIMITED PERMITTED MOVEMENTS (I.E. NO "RIGHT TURN ON RED"). IT ALLOWS FOR PEDESTRIANS TO ENTER AN INTERSECTION AND CROSSWALK AT A RIGHT ANGLE. ALTHOUGH THE RAMP DOES NOT INTERSECT THE BACK OF THE CURB AT A RIGHT ANGLE. IT IS IMPORTANT TO NOTE THAT THE TRANSITIONS FROM FULL CURB HEIGHT TO DEPRESSED CURB OCCUR WITHIN THE RADIUS. THIS DETAIL SHOULD BE USED WHERE INTERSECTION GEOMETRY MAKES IT UNDESIRABLE TO HAVE PEDESTRIANS ENTER A CROSSWALK ON A SKEW. FLARE SLOPES ARE SHOWN AS 10:1 MAXIMUM WITH 12:1 PREFERRED.THIS ALLOWS FOR CONSTRUCTION TOLERANCES AND SNOW AND ICY CONDITIONS.

PAIRED PERPENDICULAR RAMP WITH MINIMAL SEPARATION ON SHORT RADIUS
CURB RADIUS = 5'



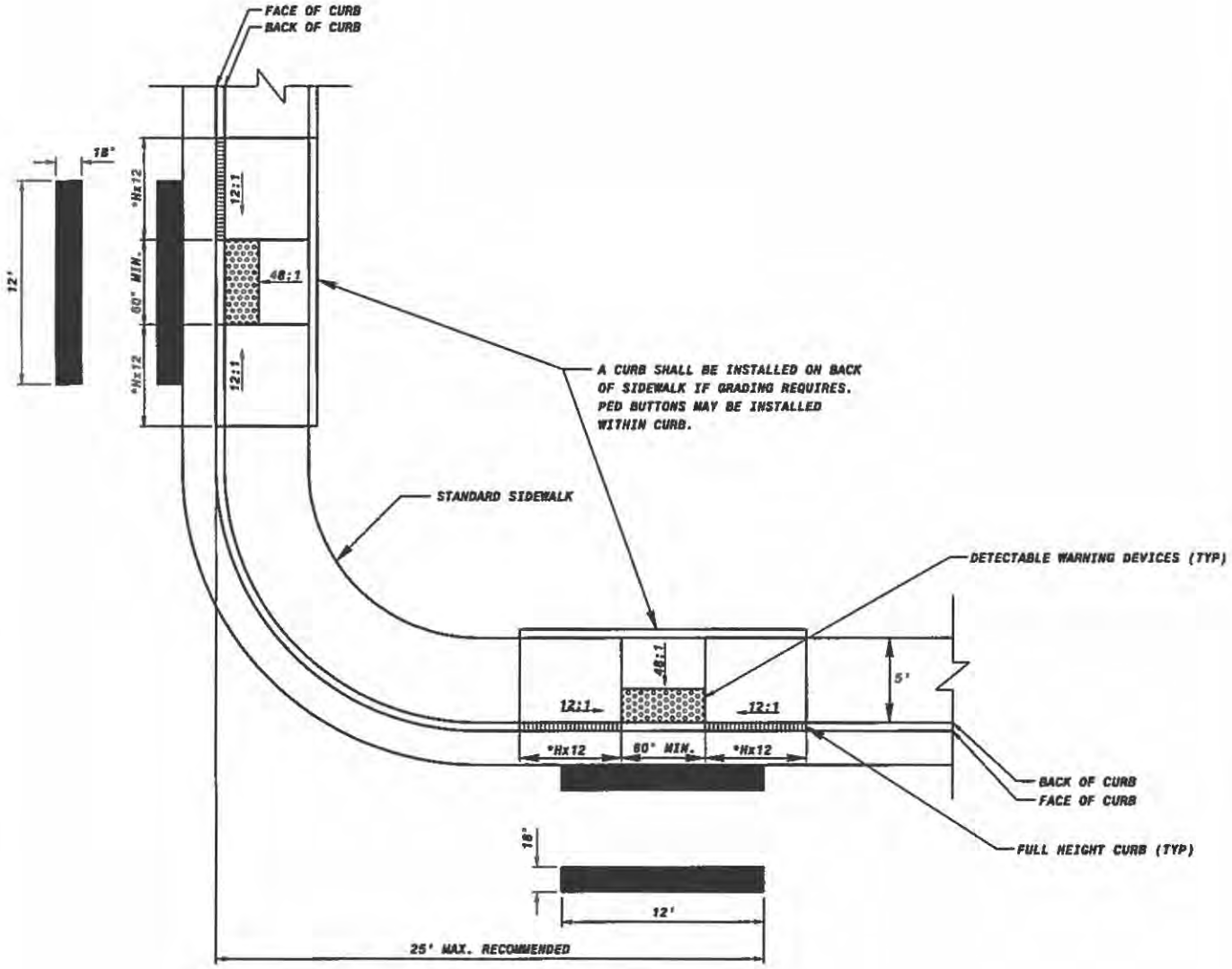
APPLICATIONS FOR THIS DETAIL INCLUDE URBAN INTERSECTIONS WITH SHARP CURB RETURNS AND WIDE SIDEWALKS. IT ALLOWS FOR PEDESTRIANS TO ENTER AN INTERSECTION AND CROSSWALK AT A RIGHT ANGLE.
FLARE SLOPES ARE SHOWN AS 10:1 MAXIMUM WITH 12:1 PREFERRED. THIS ALLOWS FOR CONSTRUCTION TOLERANCES AND SNOW AND ICY CONDITIONS.

PAIRED PARALLEL RAMP WITH OPTIMAL SEPARATION ON RADIUS = 20'



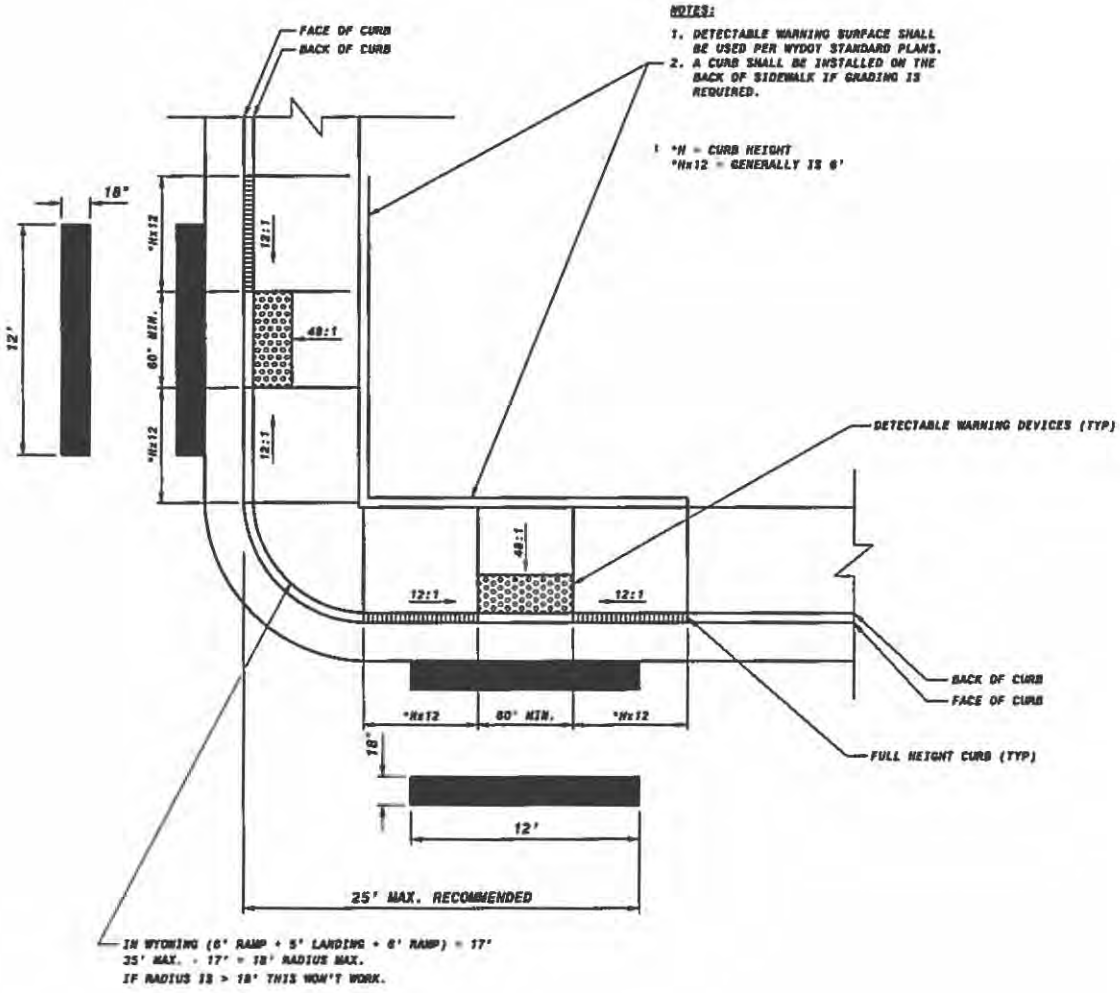
APPLICATIONS FOR THIS DETAIL INCLUDE URBAN INTERSECTIONS WITH 20' RADII CURB RETURNS AND NARROW SIDEWALKS. PEDESTRIANS USING THE RAMP WILL ENTER THE ROADWAY PERPENDICULAR TO THE CURB THEREFORE THIS DETAIL IS OPTIMAL FOR LOCATIONS WHERE THE CROSSWALK IS PLACED AT A RIGHT ANGLE TO TRAFFIC. THE LOCATION OF THE RAMP, AS SHOWN IN THIS DETAIL, IS BASED ON DEVELOPING FLARES FROM 35' OFFSET BEHIND CURB. USE OF THIS DETAIL IS MOST APPROPRIATE AT SIGNALIZED INTERSECTIONS, SINCE THE SETBACK OF THE RAMP FROM THE CROSSING ROADWAY REQUIRES THAT THE STOP BAR BE INSTALLED FARTHER BACK THAN IS DESIRABLE FOR SAFE OPERATION AS A STOP-CONTROLLED INTERSECTION.

PAIRED PARALLEL RAMP WITH OPTIMAL SEPARATION ON RADIUS = 15'



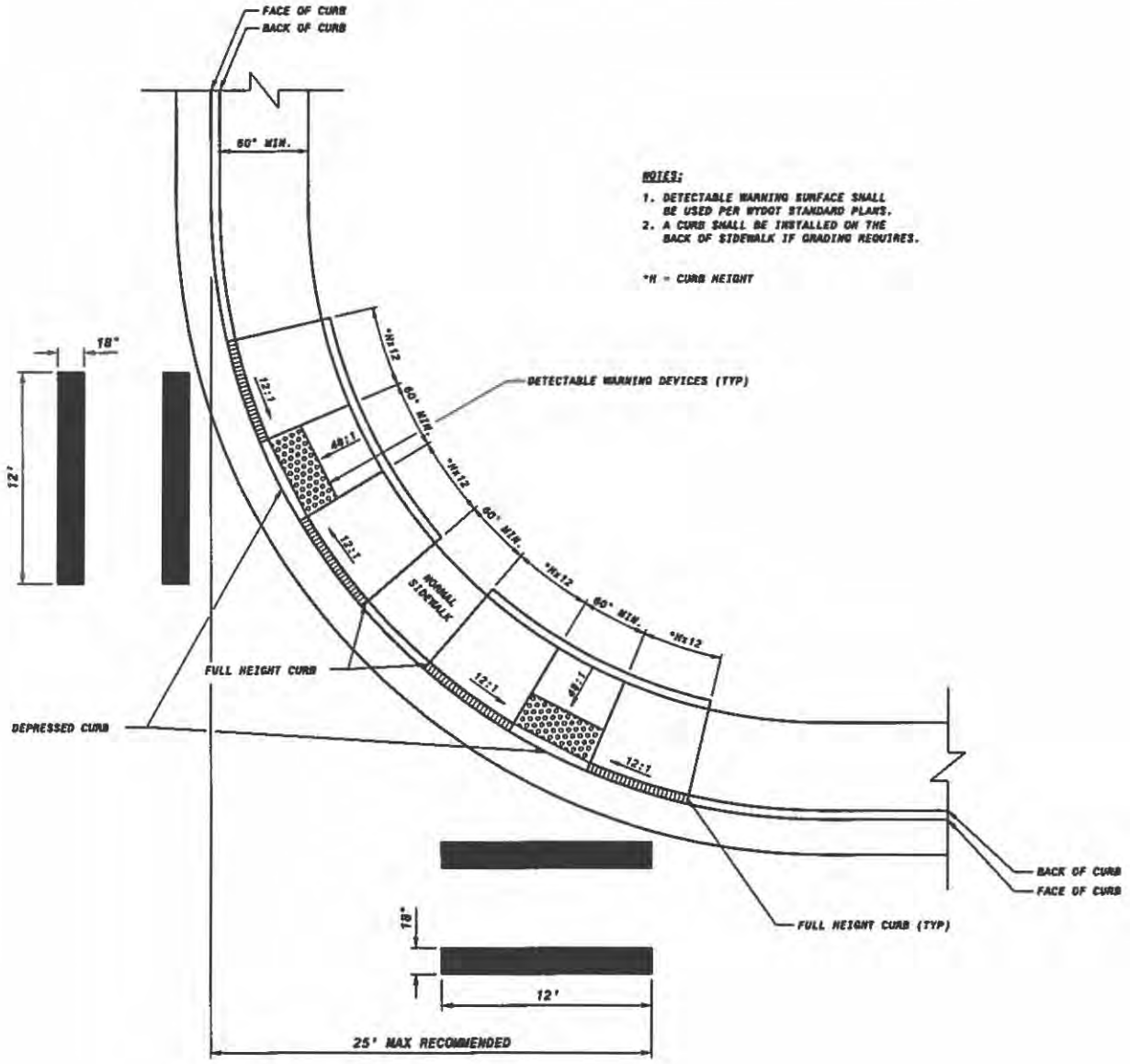
APPLICATIONS FOR THIS DETAIL INCLUDE URBAN INTERSECTIONS WITH 15' RADII CURB RETURNS AND NARROW SIDEWALKS. PEDESTRIANS USING THE RAMP WILL ENTER THE ROADWAY PERPENDICULAR TO THE CURB THEREFORE THIS DETAIL IS OPTIMAL FOR LOCATIONS WHERE THE CROSSWALK IS PLACED AT A RIGHT ANGLE TO TRAFFIC. THE LOCATION OF THE RAMP, AS SHOWN IN THIS DETAIL, IS BASED ON DEVELOPING FLARES FROM 35' OFFSET BEHIND CURB. USE OF THIS DETAIL IS MOST APPROPRIATE AT SIGNALIZED INTERSECTIONS, SINCE THE SETBACK OF THE RAMP FROM THE CROSSING ROADWAY REQUIRES THAT THE STOP BAR BE INSTALLED FARTHER BACK THAN IS DESIRABLE FOR SAFE OPERATION AS A STOP-CONTROLLED INTERSECTION.

PAIRED PARALLEL RAMP WITH OPTIMAL SEPARATION ON SHORT RADIUS CURB RADIUS = 6'



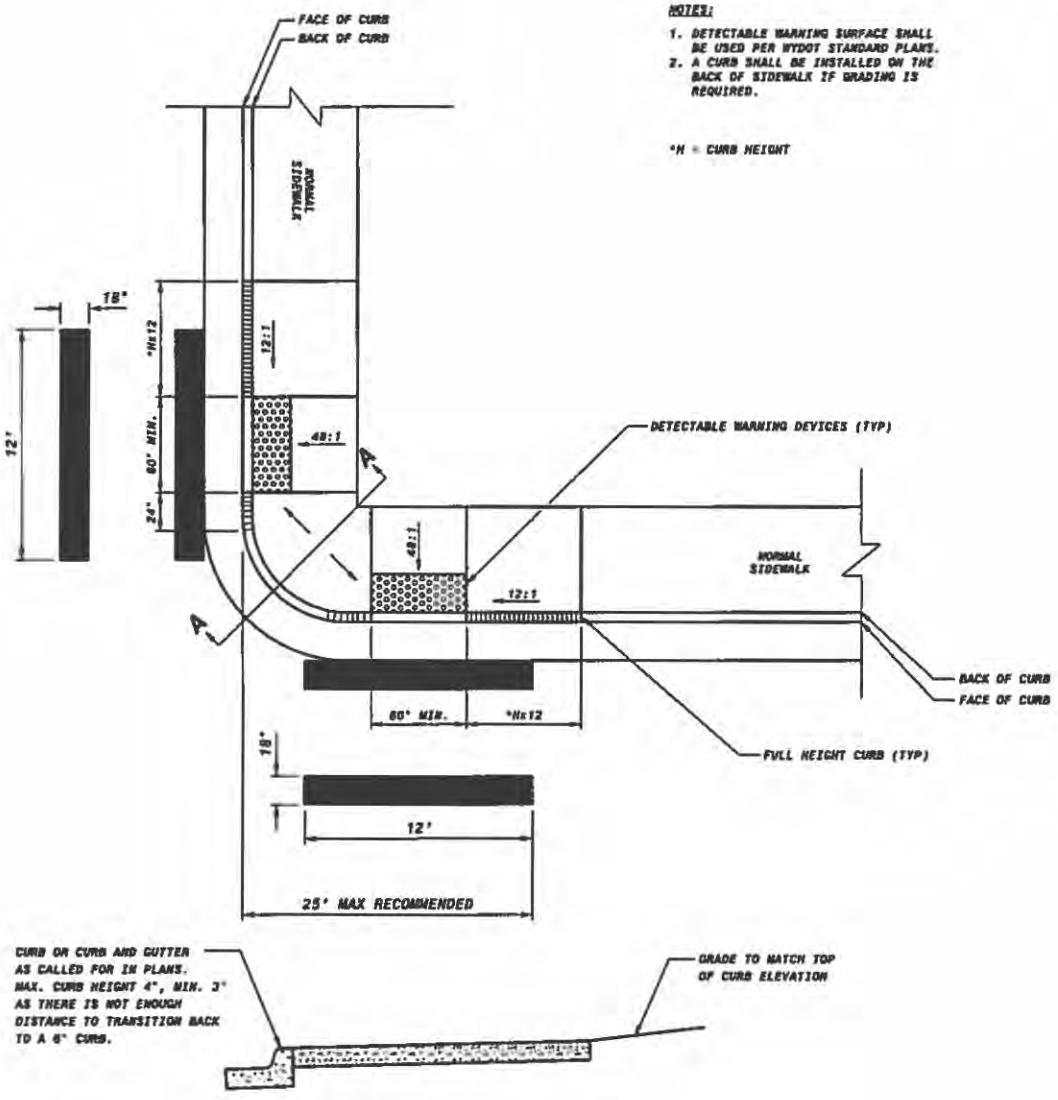
APPLICATIONS FOR THIS DETAIL INCLUDE URBAN INTERSECTIONS WITH SHARP CURB RETURNS AND NARROW SIDEWALKS. PEDESTRIANS USING THE RAMP WILL ENTER THE ROADWAY PERPENDICULAR TO THE CURB THEREFORE THIS DETAIL IS OPTIMAL FOR LOCATIONS WHERE THE CROSSWALK IS PLACED AT A RIGHT ANGLE TO TRAFFIC. THE LOCATION OF THE RAMP, AS SHOWN IN THIS DETAIL, IS BASED ON DEVELOPING FLARES FROM THE TANGENT POINT. USE OF THIS DETAIL IS MOST APPROPRIATE AT SIGNALIZED INTERSECTIONS, SINCE THE SETBACK OF THE RAMP FROM THE CROSSING ROADWAY REQUIRES THAT THE STOP BAR BE INSTALLED FARTHER BACK THAN IS DESIRABLE FOR SAFE OPERATION AS A STOP-CONTROLLED INTERSECTION. IT MAY ONLY BE APPLIED ON SIDEWALKS 5' OR GREATER.

PAIRED PARALLEL RAMP WITH OPTIMAL SEPARATION ON LONG RADIUS
CURB RADIUS = 35'



APPLICATION FOR THIS DETAIL IS APPLIED TO URBAN OR SUBURBAN INTERSECTIONS WITH LARGE CURB RADII AND NARROW SIDEWALKS. IT DOES NOT ALLOW FOR PEDESTRIANS TO ENTER AN INTERSECTION AND CROSSWALK AT A RIGHT ANGLE. USE OF THIS DETAIL IS MOST APPROPRIATE AT SIGNALIZED INSTERSECTIONS, SINCE THE SETBACK OF THE RAMP FROM THE CROSSING ROADWAY REQUIRES THAT THE STOP BAR BE INSTALLED FARTHER BACK THAN IS DESIRABLE FOR SAFE OPERATION AS A STOP-CONTROLLED INTERSECTION.

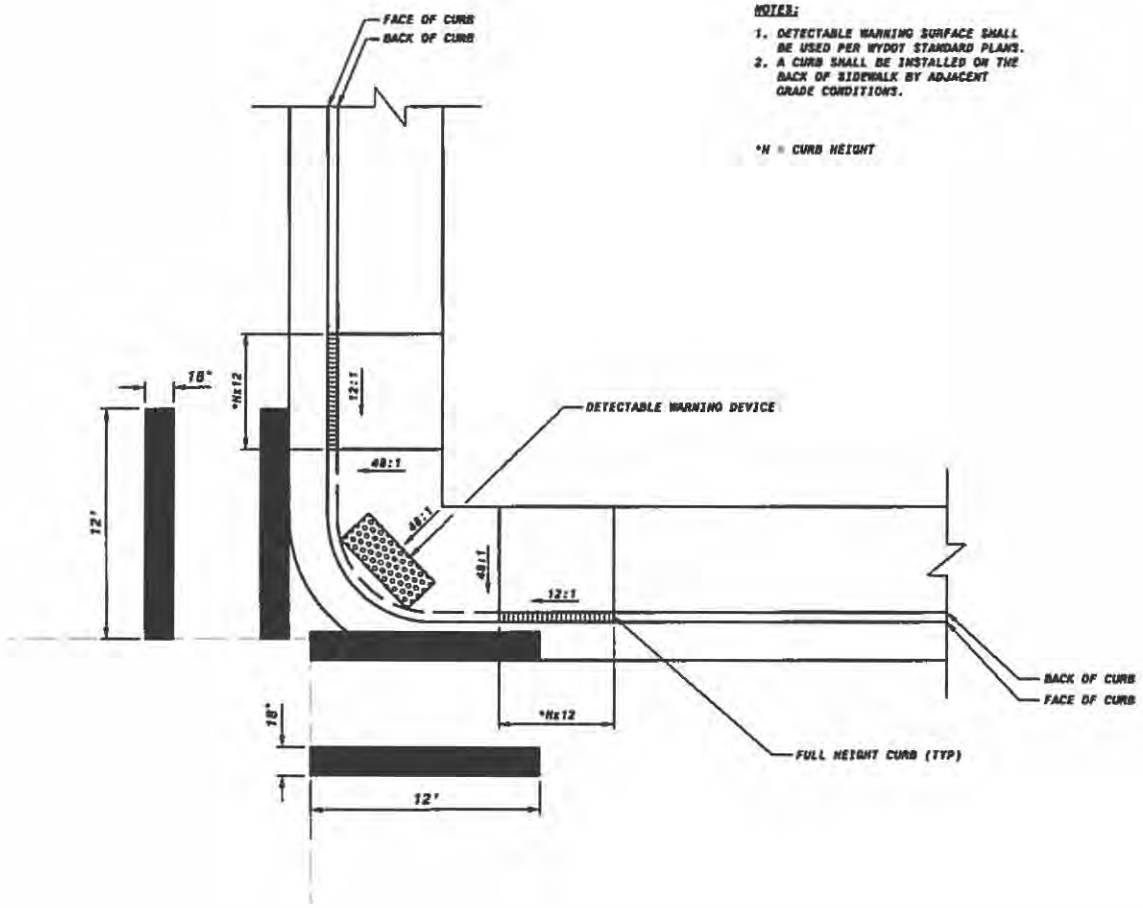
PAIRED PARALLEL RAMP WITH MINIMAL SEPARATION ON SHORT RADIUS
CURB RADIUS = 5'



SECTION A-A
not to scale

APPLICATIONS FOR THIS DETAIL INCLUDE URBAN INTERSECTIONS WITH SHARP CURB RETURNS AND NARROW SIDEWALKS. PEDESTRIANS USING THE RAMP WILL ENTER THE ROADWAY PERPENDICULAR TO THE CURB THEREFORE THIS DETAIL IS OPTIMAL FOR LOCATIONS WHERE THE CROSSWALK IS PLACED AT A RIGHT ANGLE TO TRAFFIC. THE CONSTRUCTION OF THE RAMP BEGINS IN THE CURVE. IT MAY BE APPLIED ON SIDEWALKS 5' OR GREATER.

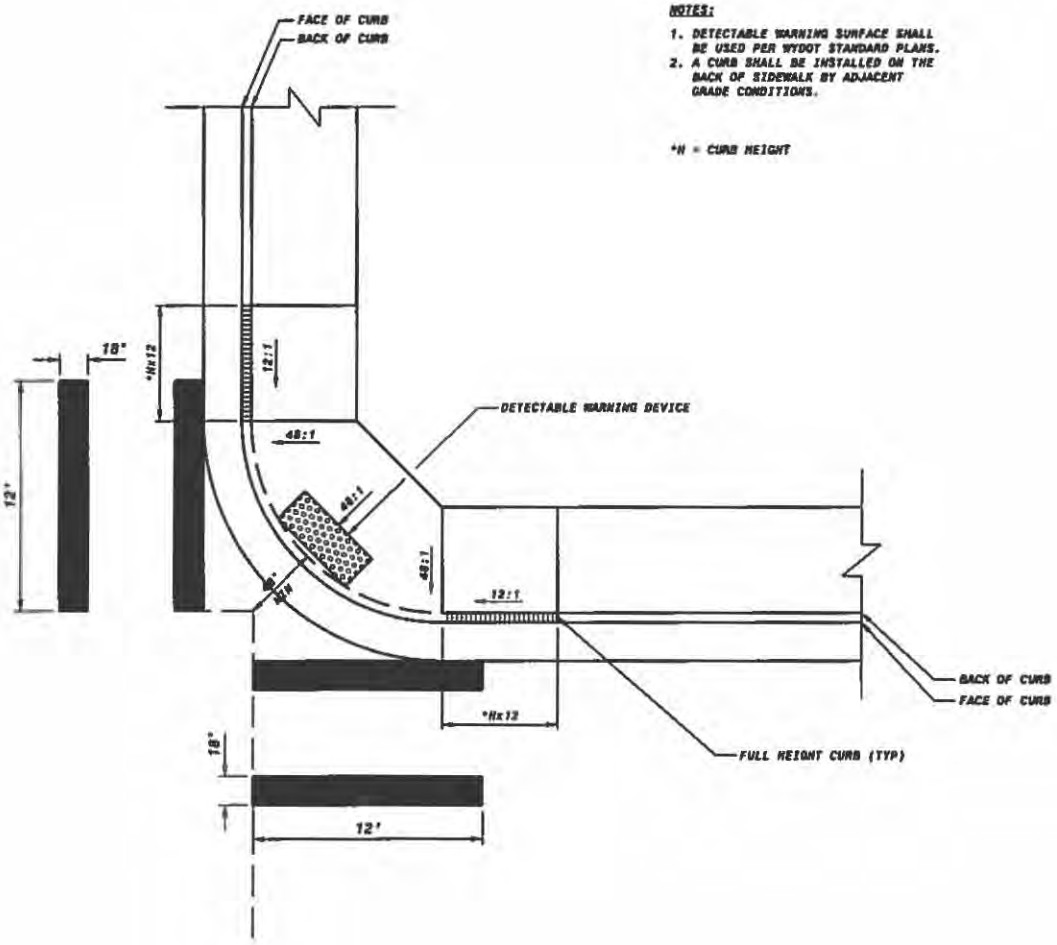
DIAGONAL PARALLEL RAMP SHORT RADIUS CURB
CURB RADIUS = 5'



APPLICATIONS FOR THIS DETAIL INCLUDE URBAN INTERSECTIONS WITH SHARP CURB RETURNS AND NARROW SIDEWALKS. PEDESTRIANS WILL ENTER THE INTERSECTION ON AN ANGLE. THE VISUALLY IMPAIRED DO NOT ADVOCATE DIAGONAL RAMPS BECAUSE IT IS REASONED THAT THE RAMP WILL DIRECT BLIND INDIVIDUALS INTO THE INTERSECTION. IF THIS RAMP IS APPLIED, AND ADJOINING SIDEWALK SHALL BE CONSTRUCTED OF 8" CONCRETE SINCE AUTOMOBILES AND TRUCKS MAY TRACK OVER THE CORNER. IT MAY BE APPLIED ON SIDEWALKS 5' WIDE OR GREATER.

THIS IS NOT A DESIRABLE INSTALLATION

DIAGONAL PARALLEL RAMP SHORT RADIUS CURB
CURB RADIUS = 10'



NOTES:

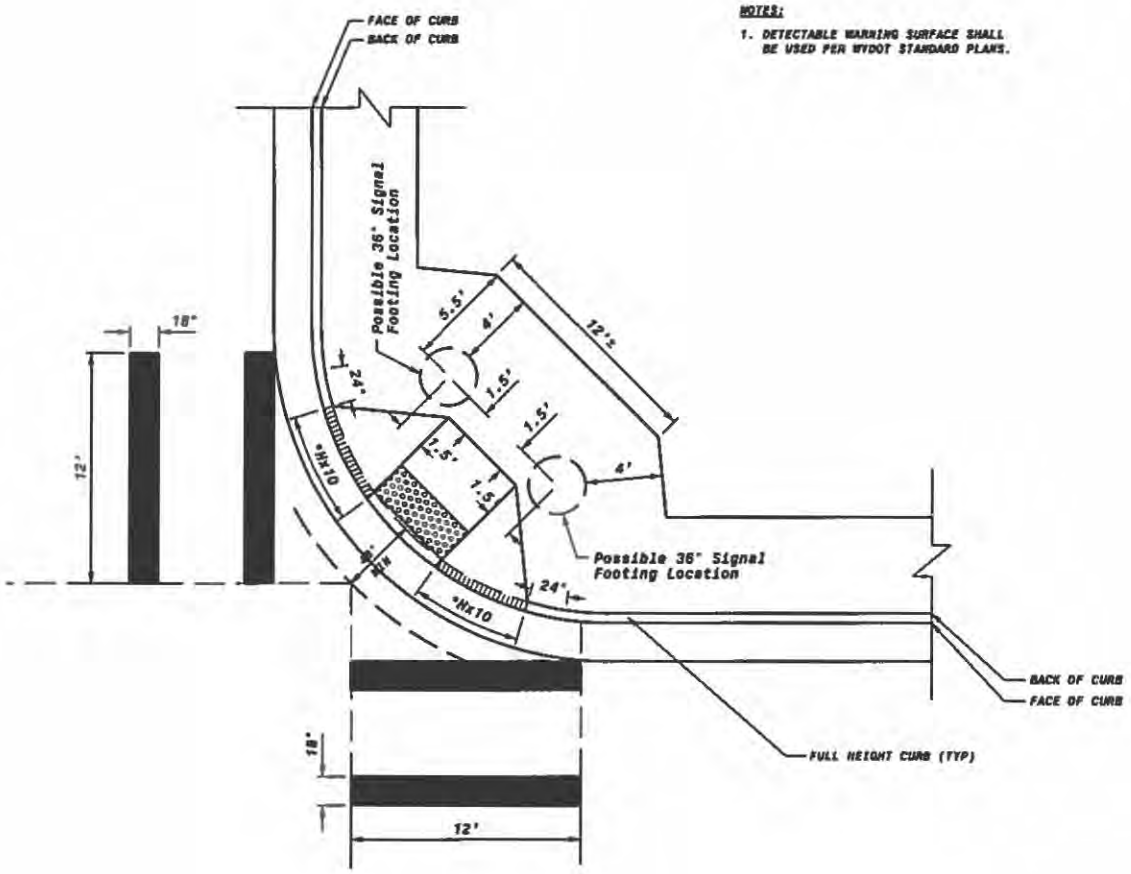
1. DETECTABLE WARNING SURFACE SHALL BE USED PER WYDOT STANDARD PLANS.
2. A CURB SHALL BE INSTALLED ON THE BACK OF SIDEWALK BY ADJACENT GRADE CONDITIONS.

*H = CURB HEIGHT

APPLICATIONS FOR THIS DETAIL INCLUDE URBAN INTERSECTIONS WITH SHARP CURB RETURNS AND NARROW SIDEWALKS. PEDESTRIANS WILL ENTER THE INTERSECTION ON AN ANGLE. THE VISUALLY IMPAIRED DO NOT ADVOCATE DIAGONAL RAMPS BECAUSE IT IS REASONED THAT THE RAMP WILL DIRECT BLIND INDIVIDUALS INTO THE INTERSECTION. IF THIS RAMP IS APPLIED, AND ADJOINING SIDEWALK SHALL BE CONSTRUCTED OF 8" CONCRETE SINCE AUTOMOBILES AND TRUCKS MAY TRACK OVER THE CORNER. IT MAY BE APPLIED ON SIDEWALKS 5' WIDE OR GREATER.

THIS IS NOT A DESIRABLE INSTALLATION

DIAGONAL PARALLEL RAMP SHORT RADIUS CURB
CURB RADIUS = 15'



APPLICATIONS FOR THIS DETAIL INCLUDE URBAN INTERSECTIONS WITH SHARP CURB RETURNS AND NARROW SIDEWALKS. PEDESTRIANS WILL ENTER THE INTERSECTION ON AN ANGLE. THE VISUALLY IMPAIRED DO NOT ADVOCATE DIAGONAL RAMPS BECAUSE IT IS REASONED THAT THE RAMP WILL DIRECT BLIND INDIVIDUALS INTO THE INTERSECTION. IF THIS RAMP IS APPLIED, AND ADJOINING SIDEWALK SHALL BE CONSTRUCTED OF 8" CONCRETE SINCE AUTOMOBILES AND TRUCKS MAY TRACK OVER THE CORNER. IT MAY BE APPLIED ON SIDEWALKS 5' WIDE OR GREATER.

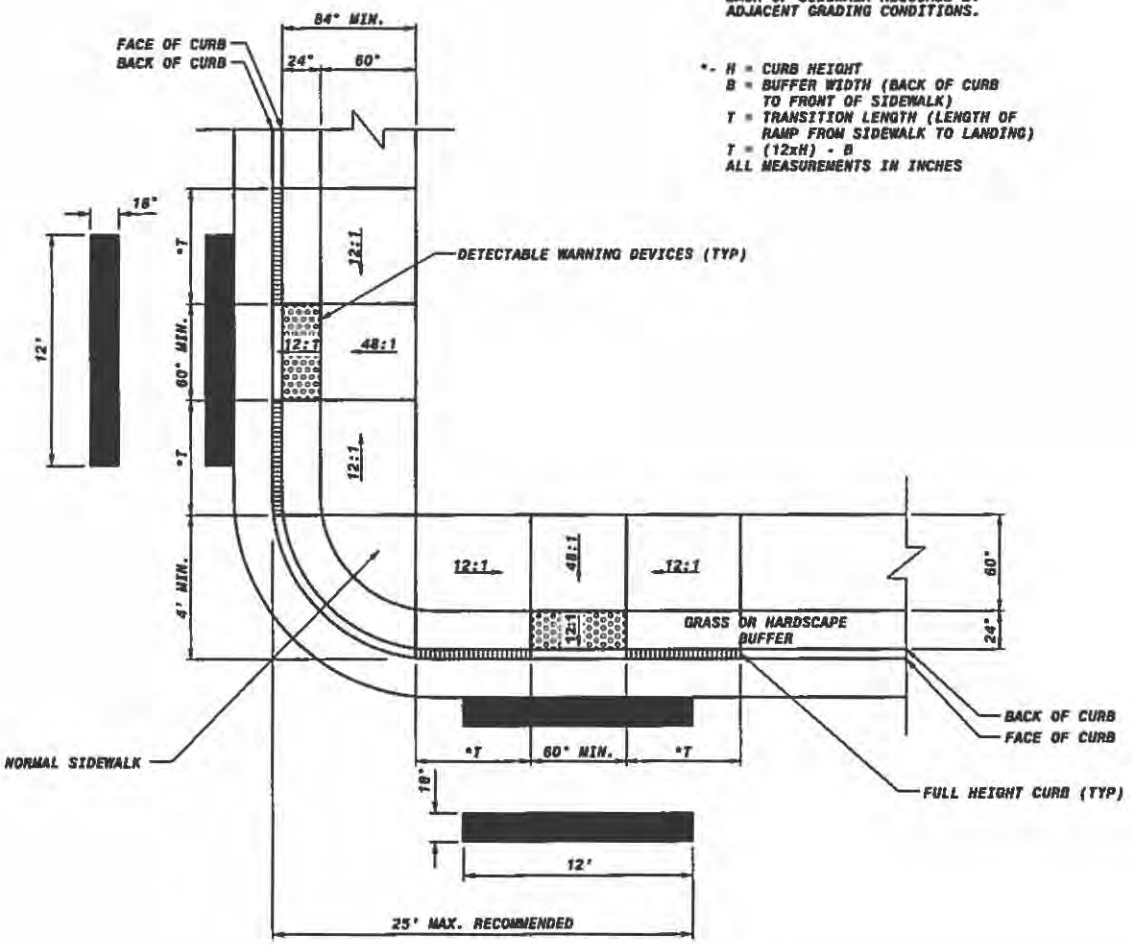
THIS IS NOT A DESIRABLE INSTALLATION

PAIRED COMBINATION WITH OPTIMAL SEPARATION ON A SHORT RADIUS
CURB RADIUS = 8'

NOTES:

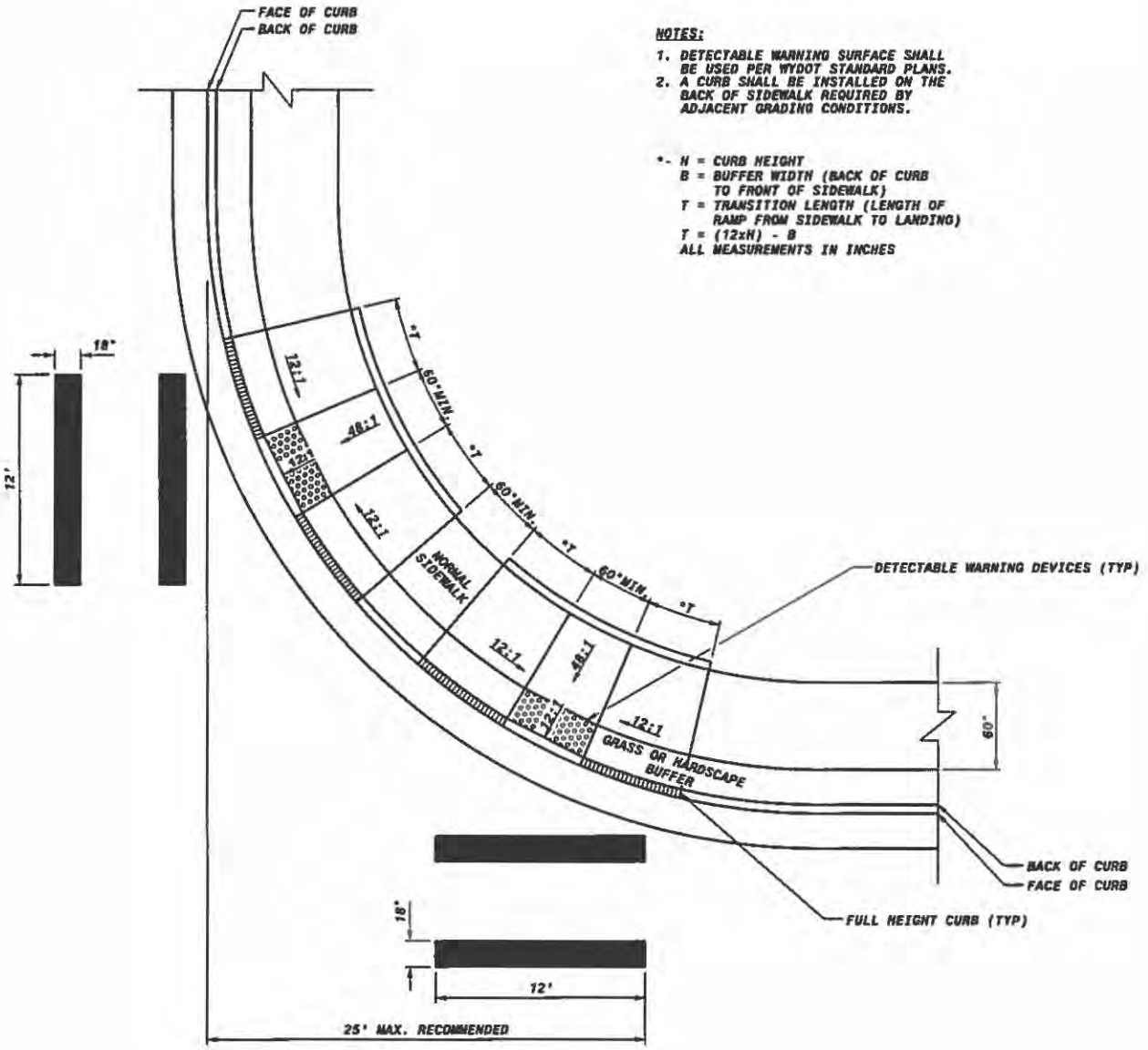
1. DETECTABLE WARNING SURFACE SHALL BE USED PER WYDOT STANDARD PLANS.
2. A CURB SHALL BE INSTALLED ON THE BACK OF SIDEWALK REQUIRED BY ADJACENT GRADING CONDITIONS.

*- H = CURB HEIGHT
B = BUFFER WIDTH (BACK OF CURB TO FRONT OF SIDEWALK)
T = TRANSITION LENGTH (LENGTH OF RAMP FROM SIDEWALK TO LANDING)
T = (12xH) - B
ALL MEASUREMENTS IN INCHES



APPLICATIONS FOR THIS DETAIL INCLUDE URBAN INTERSECTIONS WITH SHARP CURB RETURNS. PEDESTRIANS USING THE RAMP WILL ENTER THE ROADWAY PERPENDICULAR TO THE CURB THEREFORE THIS DETAIL IS OPTIMAL FOR LOCATIONS WHERE THE CROSSWALK IS PLACED AT A RIGHT ANGLE TO TRAFFIC. THE LOCATION OF THE RAMP, AS SHOWN IN THIS DETAIL, IS BASED ON DEVELOPING FLARES FROM THE TANGENT POINT. IT MAY BE APPLIED ON SIDEWALKS 8' WIDE OR GREATER.

PAIRED COMBINATION RAMP WITH OPTIMAL SEPARATION ON LONG RADIUS
CURB RADIUS = 35'



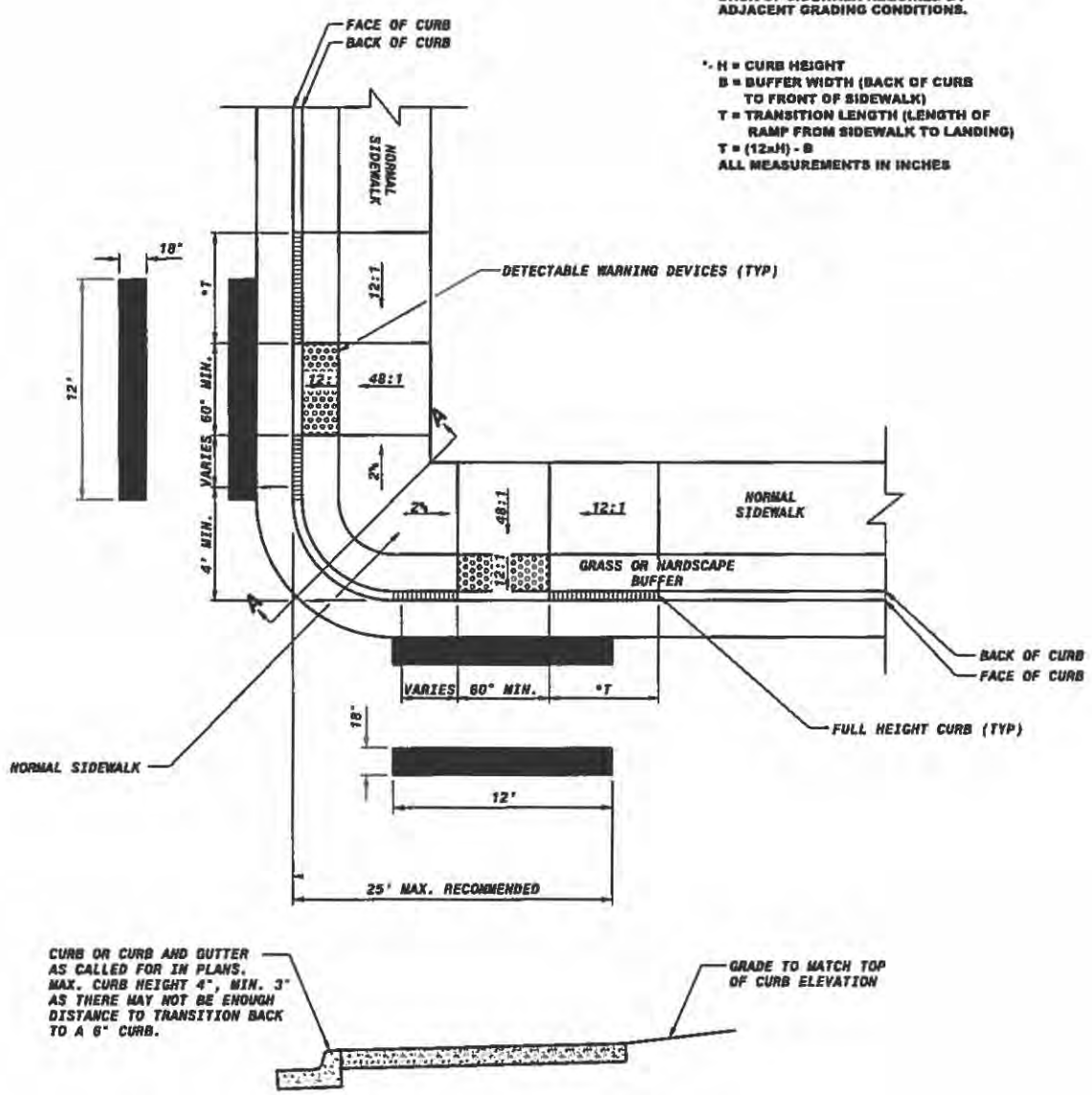
APPLICATION FOR THIS DETAIL IS APPLIED TO INTERSECTIONS WITH LARGE CURB RADII AND NARROW SIDEWALKS. IT DOES NOT ALLOW FOR PEDESTRIANS TO ENTER AN INTERSECTION AND CROSSWALK AT A RIGHT ANGLE. USE OF THIS DETAIL IS MOST APPROPRIATE AT SIGNALIZED INTERSECTIONS. SINCE THE SETBACK OF THE RAMP FROM THE CROSSING ROADWAY REQUIRES THAT THE STOP BAR BE INSTALLED FARTHER BACK THAN IS DESIRABLE FOR SAFE OPERATION AS A STOP-CONTROLLED INTERSECTION. IT MAY BE APPLIED ON SIDEWALKS 8' WIDE OR GREATER.

PAIRED COMBINATION RAMP WITH MINIMAL SEPARATION ON SHORT RADIUS
CURB RADIUS = 5'

NOTES:

1. DETECTABLE WARNING SURFACE SHALL BE USED PER WYDOT STANDARD PLANS.
2. A CURB SHALL BE INSTALLED ON THE BACK OF SIDEWALK REQUIRED BY ADJACENT GRADING CONDITIONS.

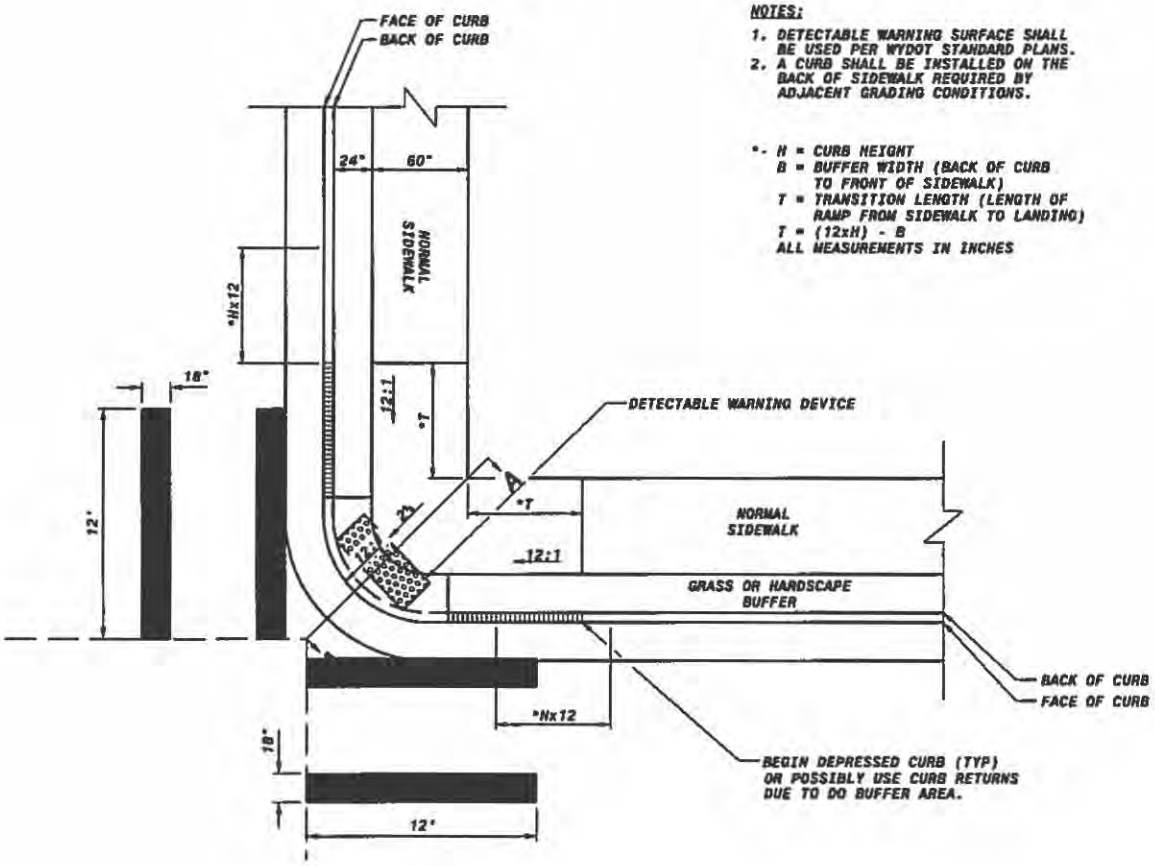
*- H = CURB HEIGHT
B = BUFFER WIDTH (BACK OF CURB TO FRONT OF SIDEWALK)
T = TRANSITION LENGTH (LENGTH OF RAMP FROM SIDEWALK TO LANDING)
T = (12xH) - B
ALL MEASUREMENTS IN INCHES



SECTION A-A
not to scale

APPLICATIONS FOR THIS DETAIL INCLUDE URBAN INTERSECTIONS WITH SHARP CURB RETURNS AND A GRASS OR HARDSCAPE BUFFER BETWEEN THE CURB AND SIDEWALK. PEDESTRIANS USING THE RAMP WILL ENTER THE ROADWAY PERPENDICULAR TO THE CURB THEREFORE THIS DETAIL IS OPTIMAL FOR LOCATIONS WHERE THE CROSSWALK IS PLACED AT A RIGHT ANGLE TO TRAFFIC. THE CONSTRUCTION OF THE RAMP BEGINS IN THE CURVE. IT MAY BE APPLIED ON SIDEWALKS 8' WIDE OR GREATER.

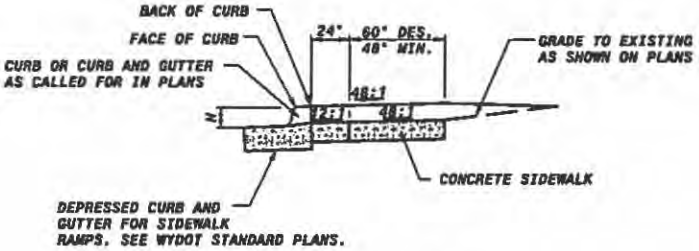
COMBINATION DIAGONAL RAMP ON SHORT RADIUS
CURB RADIUS = 5'



NOTES:

1. DETECTABLE WARNING SURFACE SHALL BE USED PER WYDOT STANDARD PLANS.
2. A CURB SHALL BE INSTALLED ON THE BACK OF SIDEWALK REQUIRED BY ADJACENT GRADING CONDITIONS.

*- H = CURB HEIGHT
B = BUFFER WIDTH (BACK OF CURB TO FRONT OF SIDEWALK)
T = TRANSITION LENGTH (LENGTH OF RAMP FROM SIDEWALK TO LANDING)
T = (12xH) - B
ALL MEASUREMENTS IN INCHES



SECTION A-A
not to scale

APPLICATIONS FOR THIS DETAIL INCLUDE URBAN INTERSECTIONS WITH SHARP CURB RETURNS AND A GRASS OR HARDSCAPE BUFFER BETWEEN THE CURB AND SIDEWALK. PEDESTRIANS WILL ENTER THE INTERSECTION ON AN ANGLE. THE VISUALLY IMPAIRED DO NOT ADVOCATE DIAGONAL RAMPS BECAUSE IT IS REASONED THAT THE RAMP WILL DIRECT BLIND INDIVIDUALS INTO THE INTERSECTION. IF THIS RAMP IS APPLIED, THE CROSSWALK STRIPING SHALL PROVIDE A MINIMUM 4' LANDING AREA IN THE ROADWAY. THE DEPRESSED CURB AND ADJOINING SIDEWALK SHALL BE CONSTRUCTED OF 8" CONCRETE SINCE AUTOMOBILES AND TRUCKS MAY TRACK OVER THE CORNER. IT MAY BE APPLIED ON SIDEWALKS 8' WIDE OR GREATER.

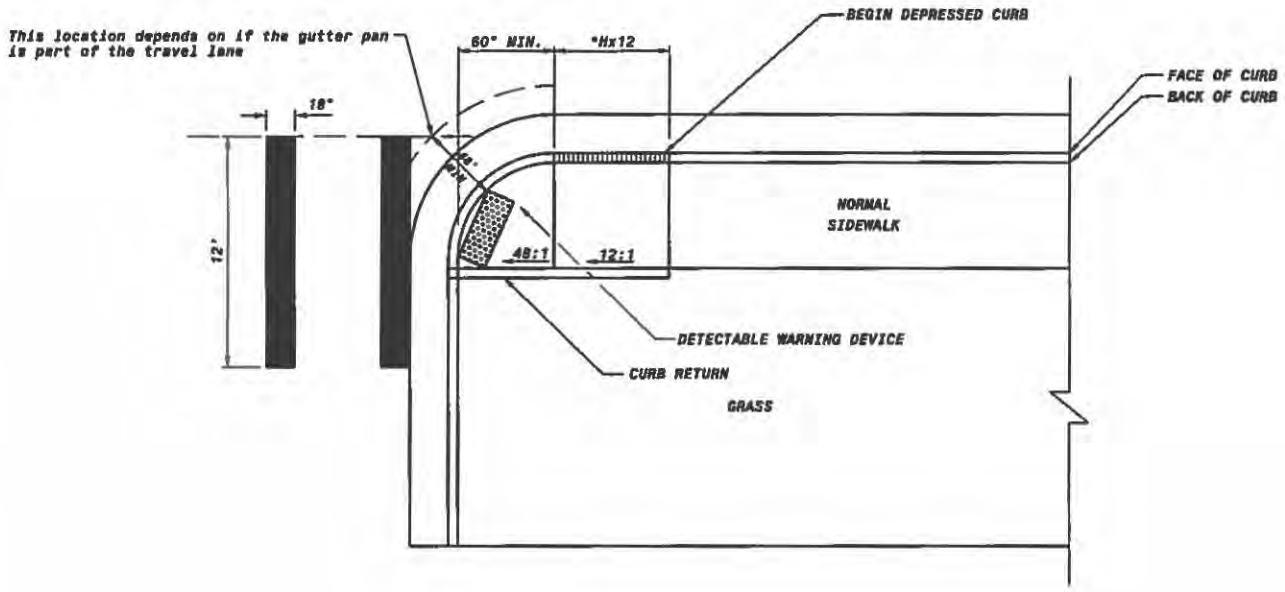
THIS IS NOT A DESIRABLE INSTALLATION

SINGLE PARALLEL RAMP ON SHORT RADIUS
CURB RADIUS = 5'

NOTES:

1. DETECTABLE WARNING SURFACE SHALL BE USED PER WYDOT STANDARD PLANS.

*H = CURB HEIGHT



APPLICATIONS FOR THIS DETAIL INCLUDE URBAN AND SUBURBAN INTERSECTIONS WITH SHARP CURB RETURNS AND SIDEWALKS IN ONE DIRECTION. PEDESTRIANS WILL ENTER THE INTERSECTION AT A RIGHT ANGLE. IT MAY BE APPLIED ON SIDEWALKS 5' WIDE OR GREATER.