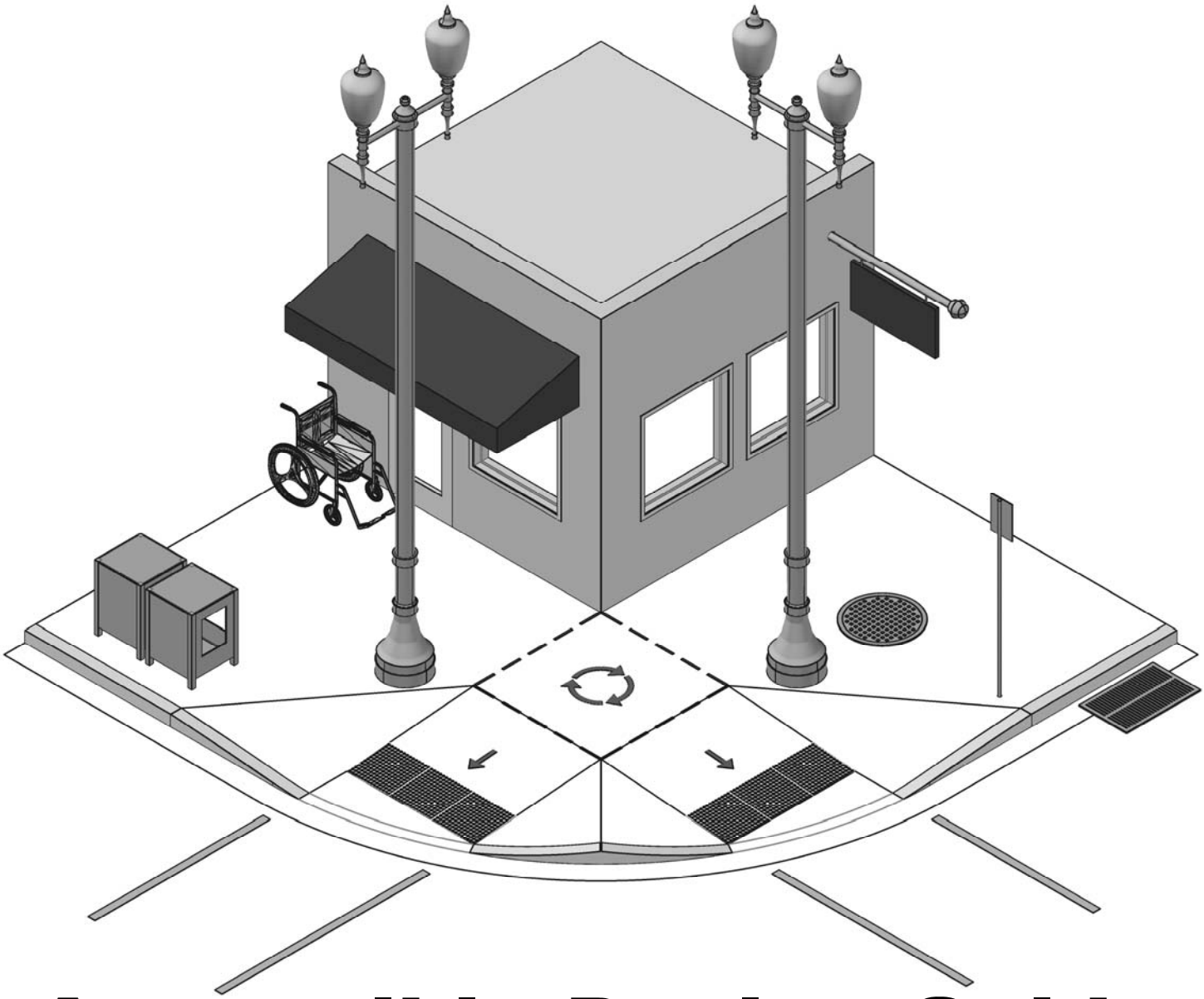
City of Chicago

Department of Transportation



Accessible Design Guide

for Appendix B - ADA Standards

CDOT
CHICAGO DEPARTMENT
OF TRANSPORTATION

August 2012

LCM ARCHITECTS
819 S. WABASH AVENUE
CHICAGO, ILLINOIS 60605
312-913-1717 FAX 913-1727

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1.0 Overview

1.1 Overview - Introduction

1.1.1 General Introduction to the Guide

This design guide is intended to serve as a supplement to the City of Chicago Department of Transportation's *Appendix B - Requirements for Openings, Construction and Repair in the Public Way - ADA Standards.* These design and construction standards, for new construction and alterations to existing conditions, have been developed to ensure that pedestrians with mobility impairments are given the same levels of access, convenience, and safe travel as all other pedestrians. This design guide will provide a better understanding of the standards which will result in better designed and constructed solutions.

It must be the goal of engineers, architects and construction professionals to understand the importance of accessible design so features constructed in the public way in the past are made usable and accessible. Additionally, it is important to consider accessible design with a big-picture view. To not think of the public way as a pedestrian network, with all aspects of construction compliant, would be to deny accessibility, convenience, and safety.

1.1.2 Regulation & Enforcement

Title II of the Americans with Disabilities Act (ADA) impacts all state and local government services. Title II requires that facilities constructed or altered after January 26, 1992 are usable by persons with disabilities. While some accessibility rules may have been in affect prior to this date, the ADA transformed accessibility provisions into federal law. Denying a disabled person access to a public facility is grounds for a civil rights action. Municipalities may be at risk if improvements do not provide for accessible and compliant pedestrian ways. At a minimum, compliant work performed must follow the provisions of the ADA Accessibility Guidelines (ADAAG), developed by the U.S. Access Board. The U.S. Department of Justice (DOJ) has incorporated the 2004 version of ADAAG into the 2010 ADA Standards, which has legal authority for accessible facility design.

These guidelines must be adhered to and work must be constructed typically in a way that provides equivalent facilitation (refer to Section 1.2). In alterations to the existing as-built environment, the end result of the areas modified must be fully compliant and accessible unless deemed technically infeasible (refer to Section 8.4 for additional information).

Enforcement of these accessibility requirements is under the jurisdiction of the DOJ. The U.S. Department of Transportation (DOT) is the agency responsible for compliance enforcement in areas related to transportation, including highways, streets, and traffic management. Overseeing the DOT mandate is the Federal Highway Administration (FHWA).

1.1.3 Accessibility Requirements in the Public Way

Accommodating accessibility in the public way may be a challenging task. Existing conditions may offer restrictions to adherence to the federal guidelines. Site topography, availability of right-of-way and coordination with other engineering efforts including traffic movement or street drainage are some of the conditions that may be encountered. The need for

1.1.3 Accessibility Requirements in the Public Way (cont.)

advisement in such matters in the public way is apparent because the federal accessibility guidelines (ADAAG) were developed primarily for building and site construction. The U.S. Access Board, responsible for ADAAG, has been involved in creating a set of draft accessibility guidelines specific to the public way, called the *Public Rights-of-Way Accessibility Guidelines* (PROWAG). The Chicago Department of Transportation (CDOT) *Appendix B - Requirements for Openings, Construction and Repair in the Public Way - ADA Standards* is based on these draft guidelines per advisement by the U.S. DOT.

Since the architect or engineer must assume responsibility for the requirements of compliant accessible design, *Appendix B* provides these construction professionals with accessibility requirements for typical curb ramps, sidewalks, and alley or driveway construction. Since the accessibility requirements in *Appendix B* are more strict than ADAAG, it is assured that all federal guidelines will be met.

The construction professional responsible for the physical work performed may also be responsible for any other pertinent construction requirements pertaining to items other than accessibility. Refer to Section 1.3 for a listing of some pertinent referenced construction standards and other design resources.

Accessibility is not only a federal requirement, but a way to provide a safer and more functional environment for all pedestrians in the public way.

1.1.4 Alterations to the Existing As-Built Environment

When proposing alterations to the existing public way, it is sometimes challenging to provide preferred designs while adhering to the more stringent accessibility standards used by CDOT. In these cases, deviations may be permitted from the CDOT accessibility standards, but **all federal minimum and maximum design requirements must be satisfied (ADAAG)**. All design options utilizing the CDOT standards must be reviewed and exhausted before committing to any alternate option. This design guide will reference some situations which may require deviation from the CDOT standards in order to provide an accessible and usable finished product.

A typical goal in alterations to the existing as-built environment is to provide the maximum amount of accessibility while addressing all of the pertinent engineering aspects of the project. While many options are available, it is important to choose the design that provides the **most improved end result**. Unless an improvement is deemed technically infeasible, an acceptable improvement can usually be made even if a fully compliant end product is not attainable.

However, in work involving alterations to the existing as-built environment, **accessibility to existing facilities cannot be reduced**. Refer to Section 8.2 for additional information.

This design guide has been created primarily to clarify necessary improvements and alterations to the existing as-built environment with respect to accessibility. All construction, new or alterations, must follow all applicable codes and requirements.

1.2 Overview - Definitions & Abbreviations

1.2.1 Key Definitions*

Accessible - A site, building, facility, or portion thereof that complies with the requirements of ADAAG.

Accessible Pedestrian Signal - A device that communicates information about the WALK/NO WALK phases in audible and vibrotactile formats at signalized intersections.

Alteration - A change to a facility in the public right-of-way that affects or could affect access, circulation, or use.

Clear - Unobstructed.

Clear Floor Space - The minimum unobstructed floor or ground space required to accommodate a single, stationary wheelchair and occupant (30" width x 48" length minimum).

Cross Slope - The grade that is perpendicular to the direction of accessible pedestrian travel. On a sidewalk, shoulder, or blended transition, it is measured perpendicular to the curb line or edge of the street or highway; on a curb ramp, it is measured perpendicular to the running slope.

Crosswalk - (As defined in MUTCD Section 1A13.18) (a) That part of a roadway at an intersection included within the connections of the lateral lines of the sidewalks on opposite sides of the highway measured from the curbs or in the absence of curbs, from the edges of the traversable roadway, and in the absence of a sidewalk on one side of the roadway, the part of a roadway included within the extension of the lateral lines of the sidewalk at right angles to the centerline; (b) any portion of a roadway at an intersection or elsewhere distinctly indicated as a pedestrian crossing by lines on the surface, which may be supplemented by contrasting pavement texture, style, or color.

Curb Ramp - A short ramp cutting through a curb or built up to it.

Detectable Warning - A surface feature of truncated dome material built in or applied to the walking surface to advise of an upcoming change from pedestrian to vehicular way.

Element - An architectural or mechanical component of a building, facility, space, site, or public right-of-way.

Equivalent Facilitation - Departure from approved technical and scoping requirements by implementing other designs and technologies that will provide substantially equivalent or greater accessibility and usability of a facility.

Facility - All or any portion of buildings, structures, improvements, elements and pedestrian or vehicular routes located in a public right-of-way.

Grade Break - The meeting line of two adjacent surface planes of different grade.

Marked Crossing - A crosswalk or other identified path intended for pedestrian use in crossing a vehicular way.

Median - (As defined in MUTCD Section 1A13.48) The area between two roadways of a divided highway measured from edge of traveled way to edge of traveled way. The median excludes turn lanes. The median width might be different between intersections, interchanges, and at opposite approaches of the same intersection.

Pedestrian Access Route - A continuous and unobstructed portion of the pedestrian circulation path (sidewalk, etc.) that provides accessibility.

* Definitions are generally worded as per the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and/or the Public Rights-of-Way Accessibility Guidelines (PROWAG) with occassional minor revisions to match CDOT nomenclature.

1.2.1 Key Definitions* (cont.)

Pedestrian Circulation Path - A prepared exterior or interior way of passage provided for pedestrian travel.

Public Right-of-Way - Public land or property, usually in interconnected corridors, that is acquired for or devoted to transportation purposes.

Public Way - Any street, alley or other parcel of land open to the outside air leading to a public street, which has been deeded, dedicated or otherwise permanently appropriated to the public for public use and which has a clear width and height of not less than 10 feet.

Ramp - A walking surface that has a running slope steeper than 1:20.

Running Slope - The grade that is parallel to the direction of travel, expressed as a ratio of rise to run or as a percent.

Street Furniture - Sidewalk equipment or furnishings (including but not limited to utility pedestals, benches, newspaper dispensers, hydrants, etc.).

Technically Infeasible - Existing physical or site constraints prohibit modification or addition of elements, spaces or features which are in full and strict compliance with the minimum requirements for new construction (and alterations) which are necessary to provide accessibility.

Refer to Section 8.4 for important information regarding 'technically infeasible' construction or alterations.

Vehicular Way - A route intended for vehicular traffic, such as a street, driveway, or parking lot.

Vibrotactile - A vibrating surface, located on the accessible pedestrian signal button, that communicates information through touch.

* Definitions are generally worded as per the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and/or the Public Rights-of-Way Accessibility Guidelines (PROWAG) with occassional minor revisions to match CDOT nomenclature.

1.2.2 Abbreviations & Acronyms

AASHTO - American Association of State & Highway Transportation Officials

ADA - Americans with Disabilities Act

ADAAG - Americans with Disabilities Act Accessibility Guidelines

Aff. - Above Finished Floor (or Ground)

CBC - Chicago Building Code

CBD - Central Business District

CDOT - Chicago Department of Transportation

Dia. - Diameter

DOJ - Department of Justice

Eq. - Equal or Equivalent to

FHWA - Federal Highway Administration

Info. - Information

ITE - Institute of Transportation Engineers

Max. - Maximum

Min. - Minimum

MOPD - Mayor's Office for People With Disabilities

MUTCD - Manual on Uniform Traffic Control Devices

Obstr. - Obstruction or Obstructed

Pref. - Preferred

PROWAG - Public Rights-of-Way Accessibility Guidelines

Re. - Refer to

Sp. - Space or Spaced or Spacing

Typ. - Typical

1.3 Overview - Referenced Standards & Resources

Publications & Guidelines

CDOT Documents:
- *Appendix B, ADA Standards* (Requirements for Openings, Construction and Repair in the Public Way).
- *Key Accessibility Requirements for Construction Canopies, Scaffolding and Temporary Structures on Public Ways*.
- *Regulations for Openings, Construction and Repair in the Public Way*.
- *Street and Site Plan Design Standards*.

FHWA Documents:
- *Designing Trails and Sidewalks for Access* (2001).
- *Manual on Uniform Traffic Control Devices* (2003).

U.S. Access Board Documents:
- *Americans with Disabilities Act Accessibility Guidelines* (as Amended Through 2002).
- *Americans with Disabilities Act and Architectural Barriers Act Accessibility Guidelines* (Draft, 2004).
- *Revised Draft Guidelines for Accessible Public Rights-of-Way* (2nd Draft of PROWAG).
- *Special Report: Accessible Public Rights-of-Way - Planning and Designing for Alterations* (2007).

Other Documents:
- (AASHTO) *Guide for the Planning, Design, and Operation of Pedestrian Facilities* (2004).

Websites

Accessible Design for the Blind:
www.accessforblind.org

Americans With Disabilities Act:
www.ada.gov

American Association of State & Highway Officials:
www.transportation.org

Association of Pedestrian and Bicycle Professionals
www.apbp.org

Chicago Department of Transportation:
www.chicagodot.org

Federal Highway Administration:
www.fhwa.dot.gov

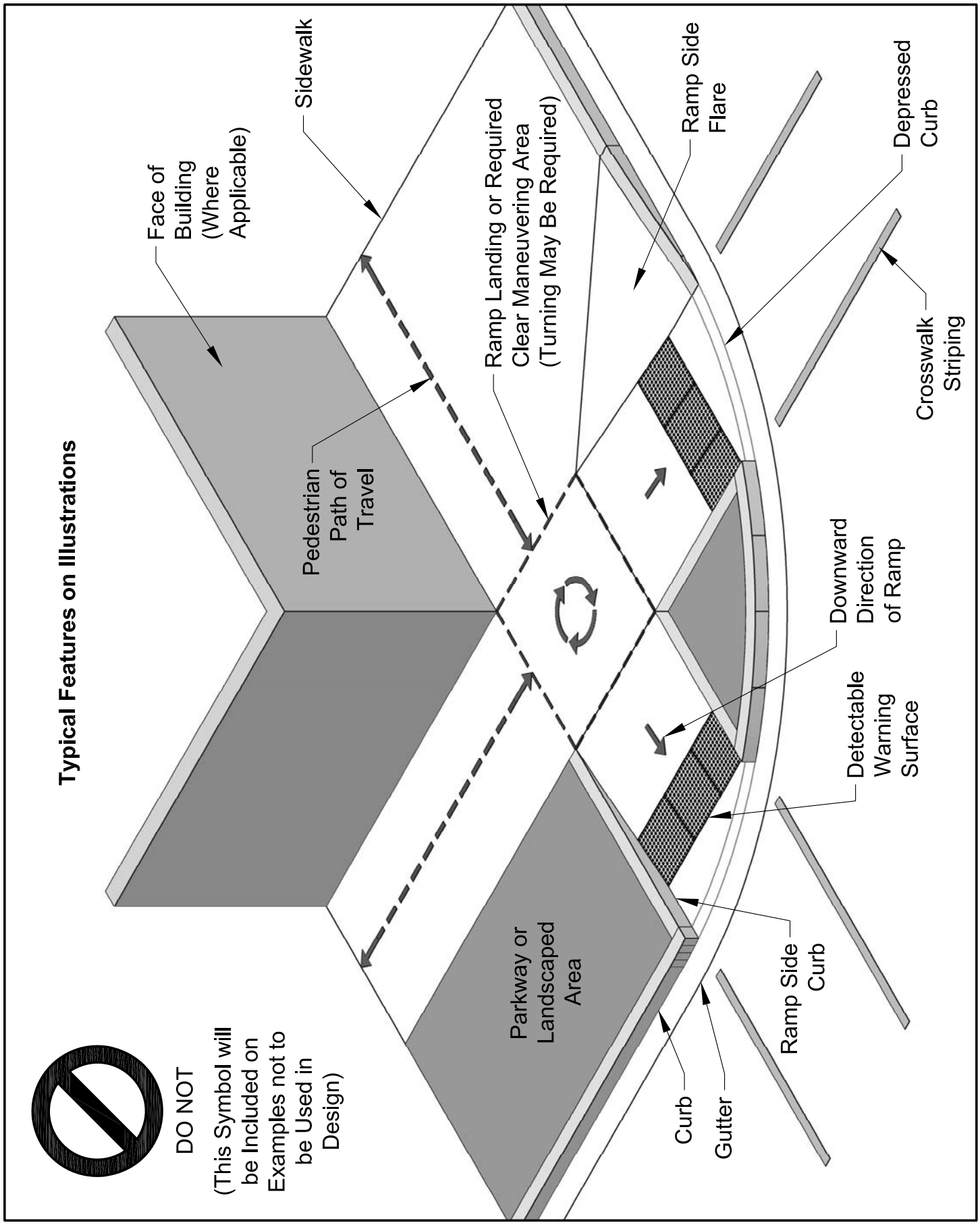
Institute of Transportation Engineers:
www.ite.org

Manual on Uniform Traffic Control Devices:
www.mutcd.fhwa.dot.gov

Pedestrian & Bicycle Information Center:
www.walkinginfo.org

United States Access Board:
www.access-board.gov

1.4 Overview - Illustration Key



1.5 Overview - Slope Conversion Chart

This design guide as well as the CDOT ADA Standard Details refer to slope measurements by ratio. This conversion chart translates the typical slopes in CDOT details into % slopes as well as inches per foot.

Slope Conversion Chart

Slope Ratio	% Slope	Inches per Foot	Decimal Feet per Foot
1:6	16.67%	2"	0.167'
1:8	12.5%	1-1/2"	0.125'
1:10	10%	1-1/4"	0.104'
1:12	8.33%	1"	0.083'
1:14	7.14%	7/8"	0.073'
1:20	5%	5/8"	0.052'
1:24	4.17%	1/2"	0.042'
1:50	2%	1/4"	0.021'
1:64	1.56%	3/16"	0.016'

2.0 Accessible Routes

2.1 Accessible Routes - Overview

The main focus of CDOT's *Appendix B - Requirements for Openings, Construction and Repair in the Public Way - ADA Standards* is curb ramp design and construction, as it is imperative that the improvements made result in compliant ramps. In addition, **the elements of an accessible pedestrian way beyond curb ramps cannot be overlooked**.

Within the public way, often there exists street furniture such as benches, newspaper stands, bus stop shelters, fire hydrants, utility pedestals, and traffic signal poles as well as a variety of other obstacles. **When planning for an accessible route through such features, a clear width allowing for pedestrian movement must be provided**. Ideally the street furniture can be located so as to improve and maximize efficient pedestrian circulation. In any case, it is important that features of street furniture do not extend or protrude into accessible routes in a way that is unsafe to the pedestrian (particularly those pedestrians with visual impairments).

Construction elements such as control and expansion joints are a necessary part of sidewalk construction, but it is important to limit gaps, holes, or level changes in the pedestrian way. Pedestrians relying on mobility assistive devices can find these elements unexpectedly inconvenient or hazardous if not limited to certain dimensions.

Occasionally, areas of the sidewalk and the crosswalk in existing conditions are shared with utility vaults and drainage structures. When utility covers must be located in the pedestrian way, the lids must comply with the typical standards of an accessible route. The gaps or vertically extruded elements of gratings or utility covers cannot conflict with the wheel of a wheelchair or the ends of walkers or canes.

As with curb ramps, the slopes of sidewalks must allow for safe pedestrian access. Excessive cross slopes or running slopes can be restrictive and may result in inaccessibility, unnecessary pedestrian exertion, inconvenience or risk of injury.

It cannot be stressed enough that pedestrian accessibility must be considered as a large network with many working pieces. The sidewalks and pedestrian ways must be designed, built, and maintained with as much care as curb ramps or any other element of accessible network.

2.2 Accessible Routes - Width Requirements

2.2.1 Typical Width Requirements

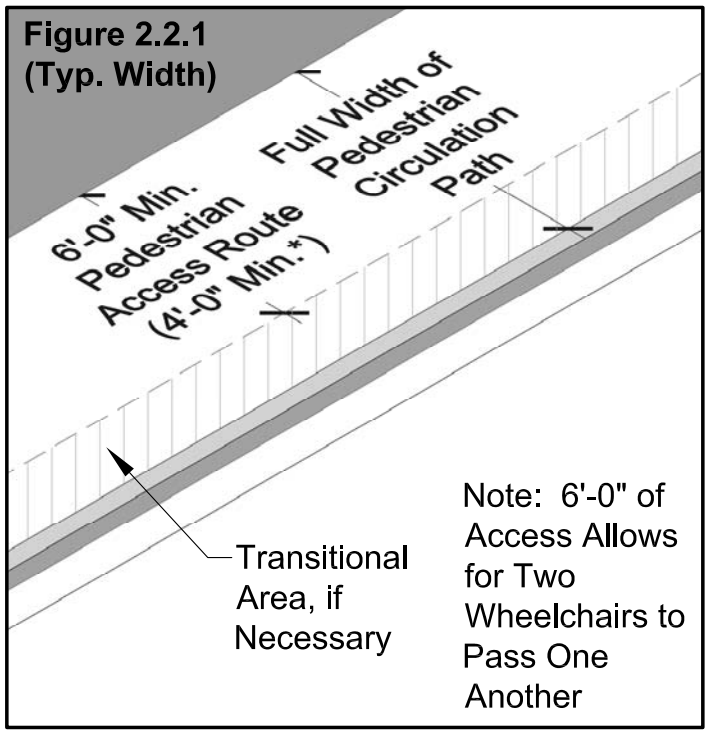
Facilitating more than the minimum required width of accessible sidewalk can be beneficial to all pedestrians. The minimum dimensions noted on this page will permit a mobility impaired pedestrian to negotiate the provided space. A sidewalk that is wide with proper slope and well placed street furniture will allow not only wheelchair users access, but will also provide for a better environment for all users traveling the pedestrian circulation path.

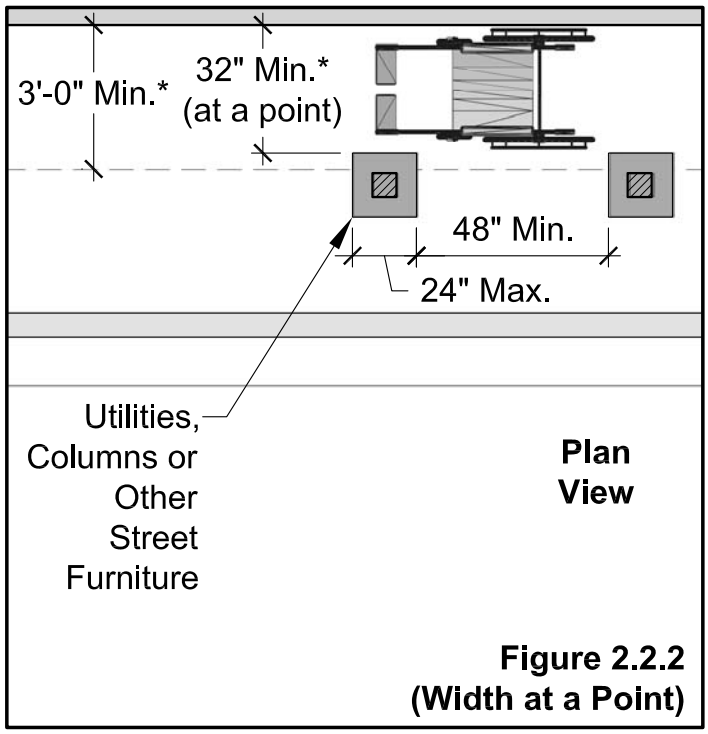
The minimum width of a pedestrian access route is 6 feet (4 feet min.*), exclusive of the width of the top of curb. Refer to the Chicago *Construction Regulations in the Public Way* and the Chicago *Street and Site Plan Design Standards* for other sidewalk requirements including width designations in particular. (Figure 2.2.1)

It may not always be possible to provide a fully accessible sidewalk for the entire width due to existing site constraints. However, providing an accessible route through a portion of the sidewalk is required. The sidewalk should be free of any obstructions, including all types of street furniture. Refer to Section 8.1 for additional information when transitioning from an accessible route to the existing top of curb.

2.2.2 Width Requirements at a Point

When implementing alterations in existing conditions, and only when absolutely necessary, the pedestrian access route width may be reduced to 36 inches minimum.* When existing street furniture is located in the public way, the pedestrian access route may be reduced to 32 inches at a point.* The object must not exceed 24 inches in depth in the direction of pedestrian travel. If multiple objects exist, when reducing the width of the pedestrian access route at a point, the objects must be separated by a minimum of 48 inches. (Figure 2.2.2)





* This dimension or condition may be applied only in alterations to the existing as-built environment when the CDOT standard is not technically feasible or cannot be implemented without creating an unfavorable design solution.

2.3 Accessible Routes - Surface Requirements

2.3.1 Gaps/Openings

It is important to limit the width of gaps/openings on the pedestrian surface that may conflict with the small front wheel of a wheelchair, a cane, a walker or a crutch and cause a break in forward movement. This disturbance could result in falls or injuries.

Gaps or openings within the pedestrian access route cannot exceed 1/2 inch unless the void is occupied by a CDOT approved filler material. Elongated gaps, such as expansion or control joints, are ideally to be situated perpendicular to the path of travel. (Figure 2.3.1)

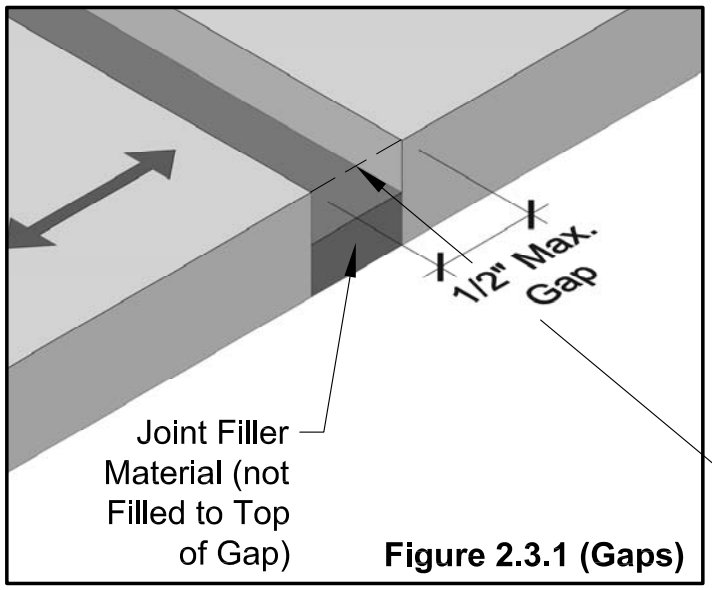


Figure 2.3.1 (Gaps)

2.3.2 Level Changes

Level changes on the pedestrian surface can be a liability for all pedestrians, but can pose a particular problem for wheelchair and rolling walker users to negotiate. These disturbances may deliver unexpected and painful vibrations felt by the pedestrian using a rolling device, if not preventing passage altogether.

Changes in level within the pedestrian access route cannot exceed 1/4 inch. (Figure 2.3.2)

Changes in level within the pedestrian access route between 1/4 inch and 1/2 inch are allowed **only when the edge is beveled**. This beveled edge cannot exceed a slope of 1:2. The overall level change cannot exceed 1/2 inch. (Figure 2.3.3)

Changes in level within the pedestrian access route greater than 1/2 inch are to satisfy typical ramp requirements (refer to Section 2.6.1 for additional information).

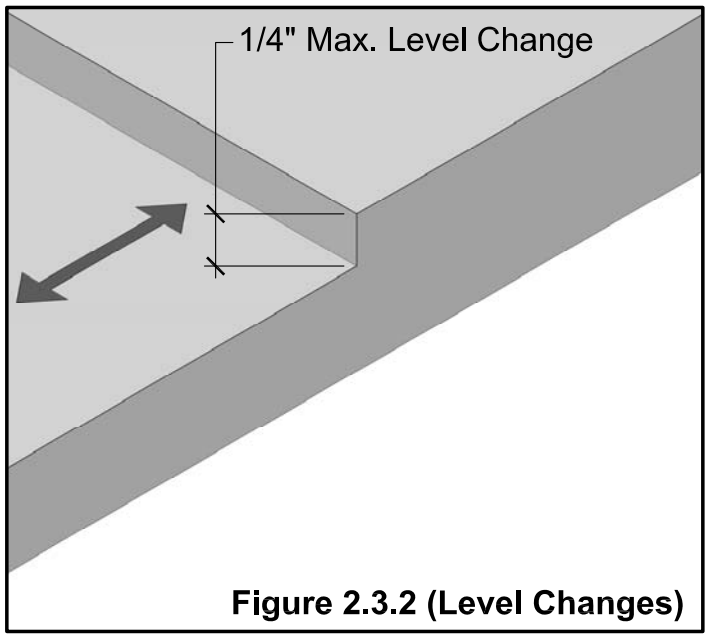


Figure 2.3.2 (Level Changes)

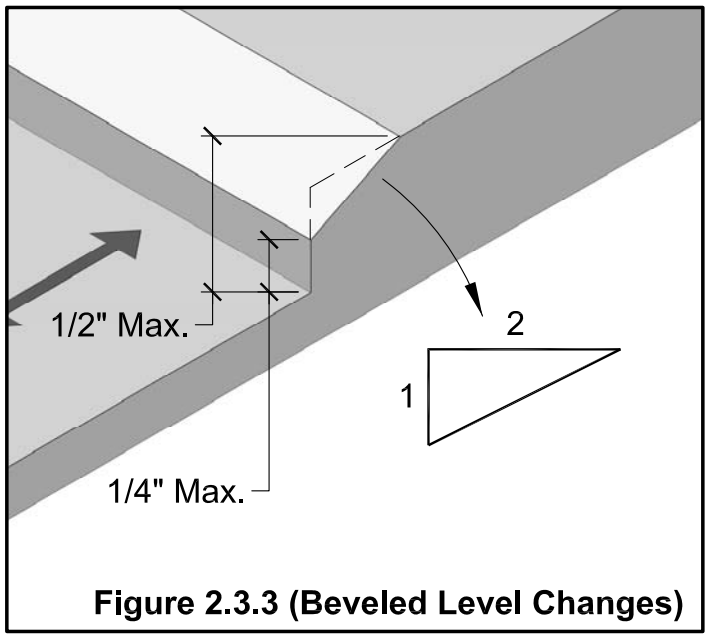


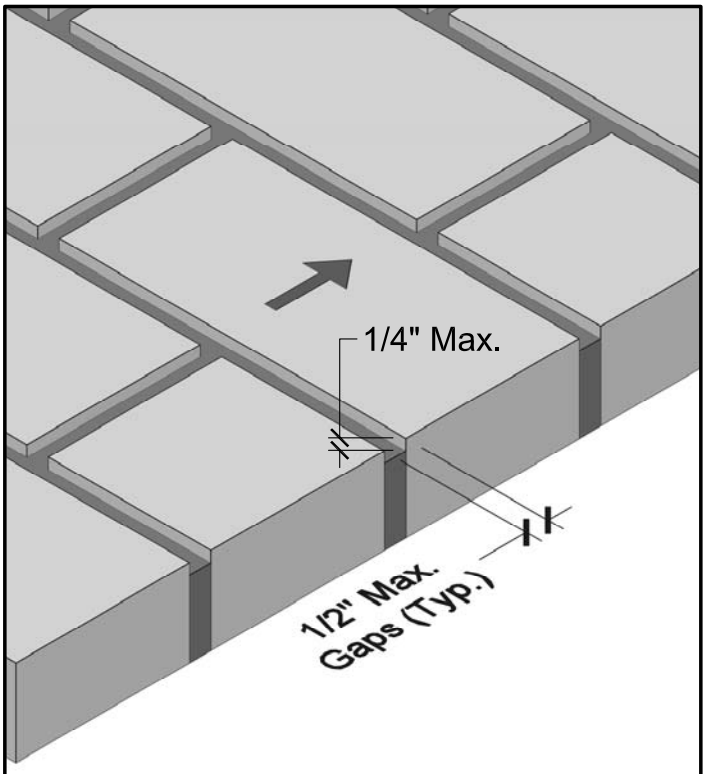
Figure 2.3.3 (Beveled Level Changes)

2.3 Accessible Routes - Surface Requirements (cont.)

2.3.3 Sidewalk Paver Units

Paver units are not a preferred surface for accessible routes. Where the accessible route must fall within a pedestrian way with a paver surface, the gap/opening and level change requirements apply. (Figure 2.3.4) The surface should be slip-resistant and properly maintained to provide a safe and smooth accessible pedestrian way.

Rough aggregate pedestrian surfaces may not always be traversable by some pedestrians and should be avoided in the accessible route.



Avoid Rough Paver Surfaces That Create Large Gaps and/or Level Changes

Figure 2.3.4 (Paver Units)

2.3.4 Utility Covers/Grates

If possible, utility covers and grates should be located outside of the pedestrian circulation path, including the area within the crosswalk striping. It is common that the surfaces of these covers or grates have gaps and/or level changes as features. Additionally, these surfaces can become a slip hazard when wet. Where utility covers and grates must be located within the accessible route, they must adhere to these surface requirements. (Figures 2.3.5, 2.3.6)

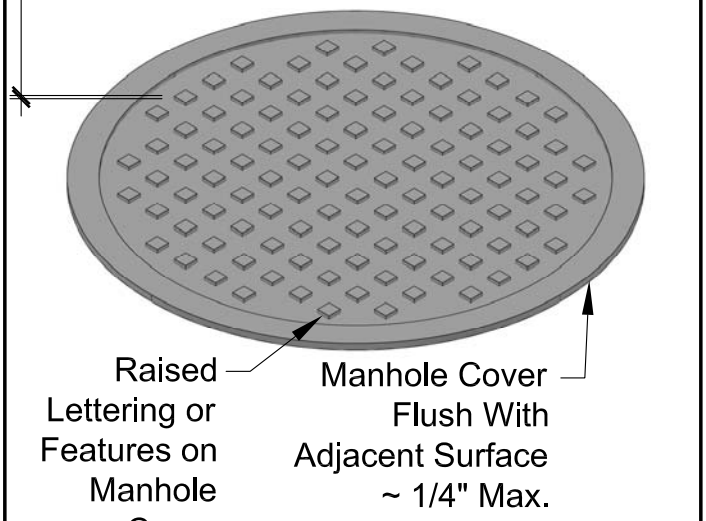


Figure 2.3.5 (Utility Covers)

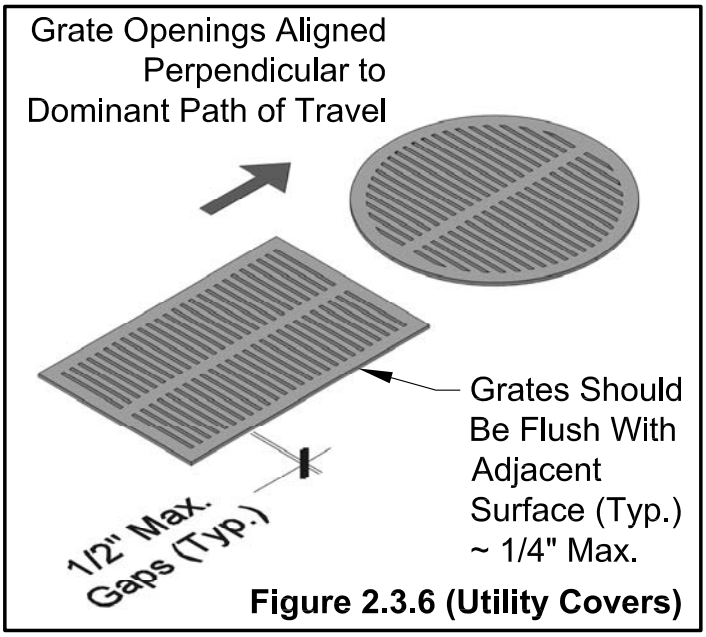


Figure 2.3.6 (Utility Covers)

2.4 Accessible Routes - Slope Requirements

2.4.1 Cross Slope

Excessive sidewalk cross slope is a constraint to accessible routes that is often overlooked by design and construction professionals, resulting in unnecessary difficulties for some pedestrians. Wheelchair users and pedestrians with canes, crutches or walkers, for example, may be forced to negotiate the side-to-side slope while attempting to move forward. Any wheeled mobility assistive device will naturally pull to the low side of the sloping sidewalk. Mobility is further challenged when sidewalks become wet and ice or snow covered. (Figure 2.4.1)

The cross slope of the pedestrian access route cannot exceed 1:64 maximum (1:50 max.*). (Figure 2.4.2, page 13) Refer to Section 2.2 for accessible route width requirements.

2.4.2 Running Slope

The running slope of the pedestrian access route cannot exceed 1:24 maximum (1:20 max.*). (Figure 2.4.2, page 13)

The running slope of the pedestrian access route is permitted to match the general grade established for the adjacent street or supporting structure (bridges, overpasses, viaducts, etc.). (Figure 2.4.3, page 13)

Where the slope of the sidewalk exceeds 1:20, excluding curb ramp locations or a slope controlled by existing established grades, ramped segments with handrails may be required. Refer to Section 2.6.1 for additional information regarding sidewalk ramps.

2.4.3 Slopes Where Turning is Required

Where pedestrian access routes intersect or round a corner, the slope should be 1:64 maximum (1:50 max.*) in all directions. This slope applies within a 4'x4' minimum area and should be in alignment with the applicable intersecting pedestrian access routes. (Figures 2.4.3, 2.4.4, page 13)

A relatively flat area at these intersections or corners will allow for pedestrians to change direction easily without having to negotiate steep cross slopes.

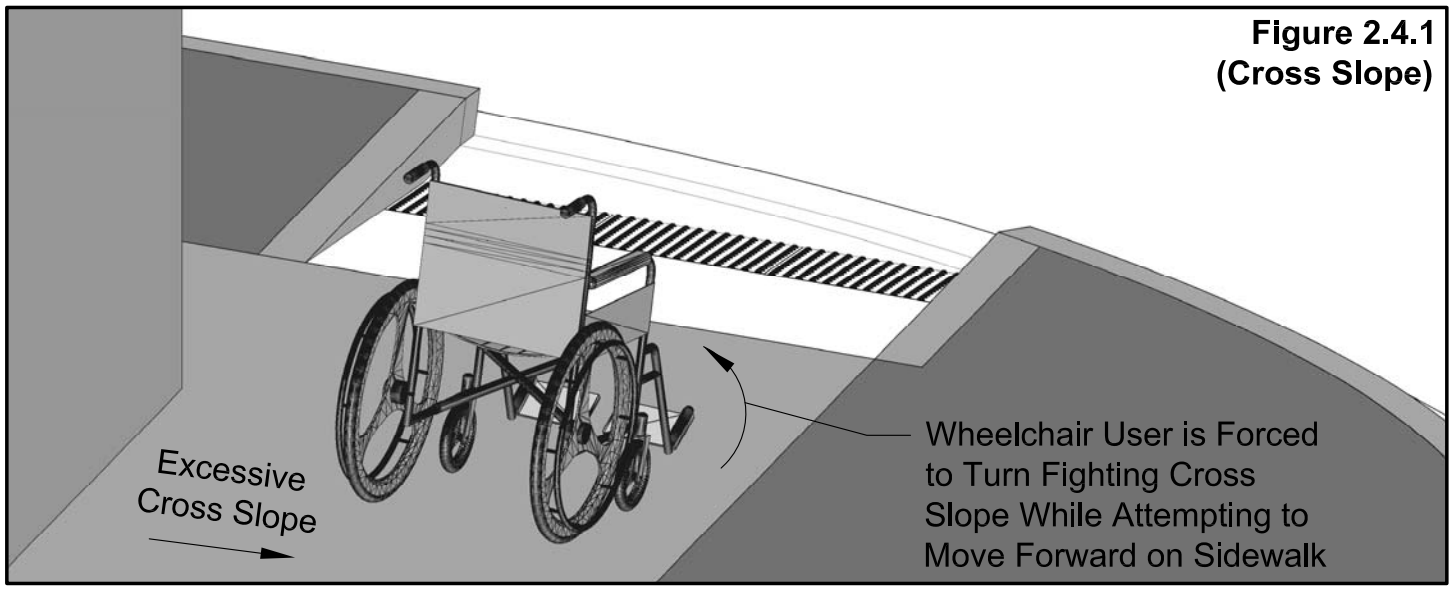


Figure 2.4.1
(Cross Slope)

* This dimension or condition may be applied only in alterations to the existing as-built environment when the CDOT standard is not technically feasible or cannot be implemented without creating an unfavorable design solution.

2.4.1 - 2.4.3 Sidewalk Slopes (cont.)

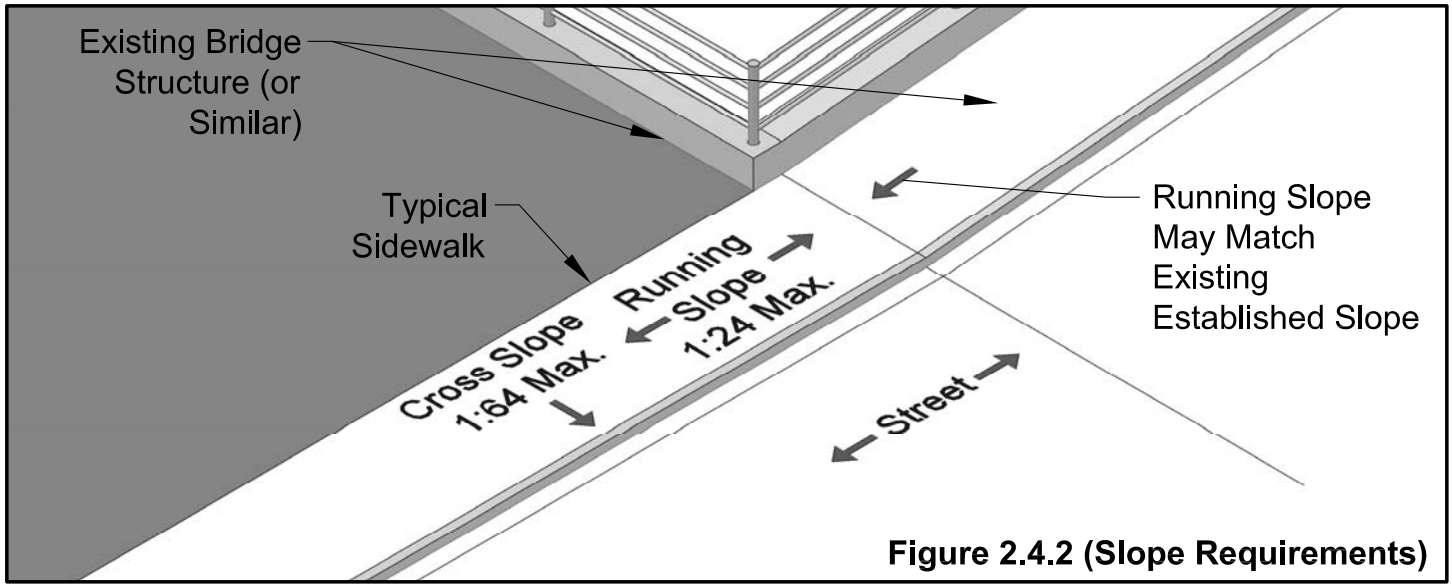


Figure 2.4.2 (Slope Requirements)

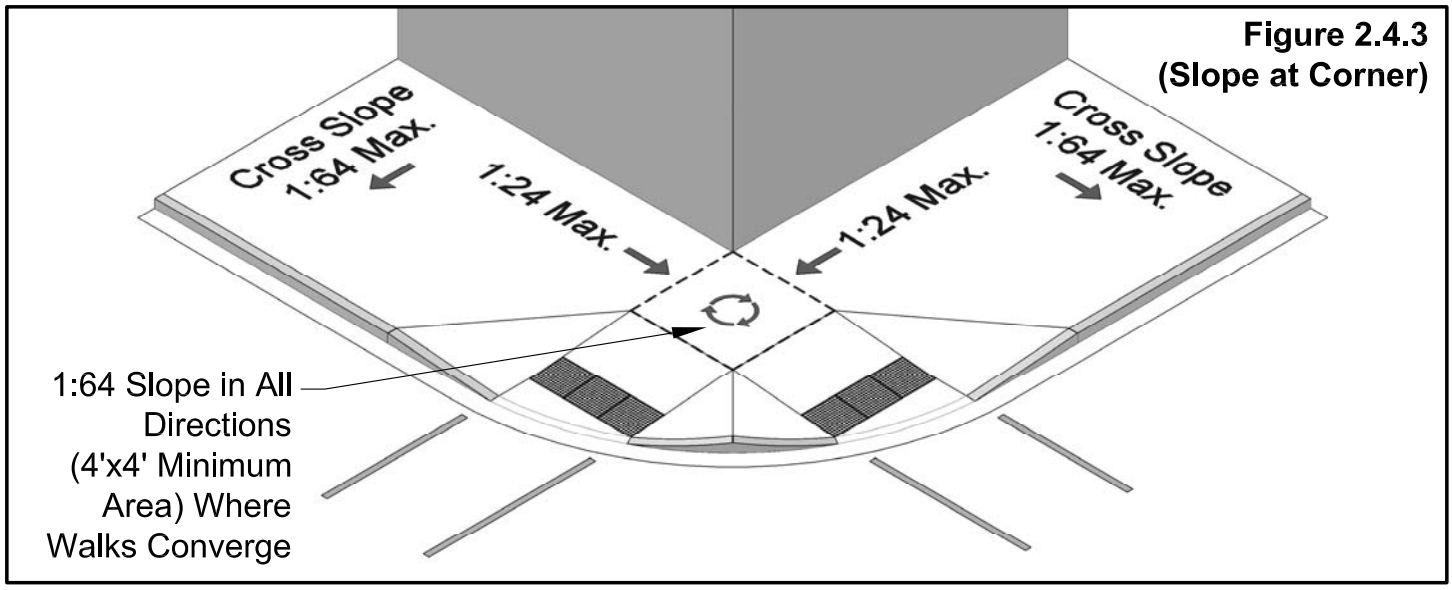


Figure 2.4.3 (Slope at Corner)

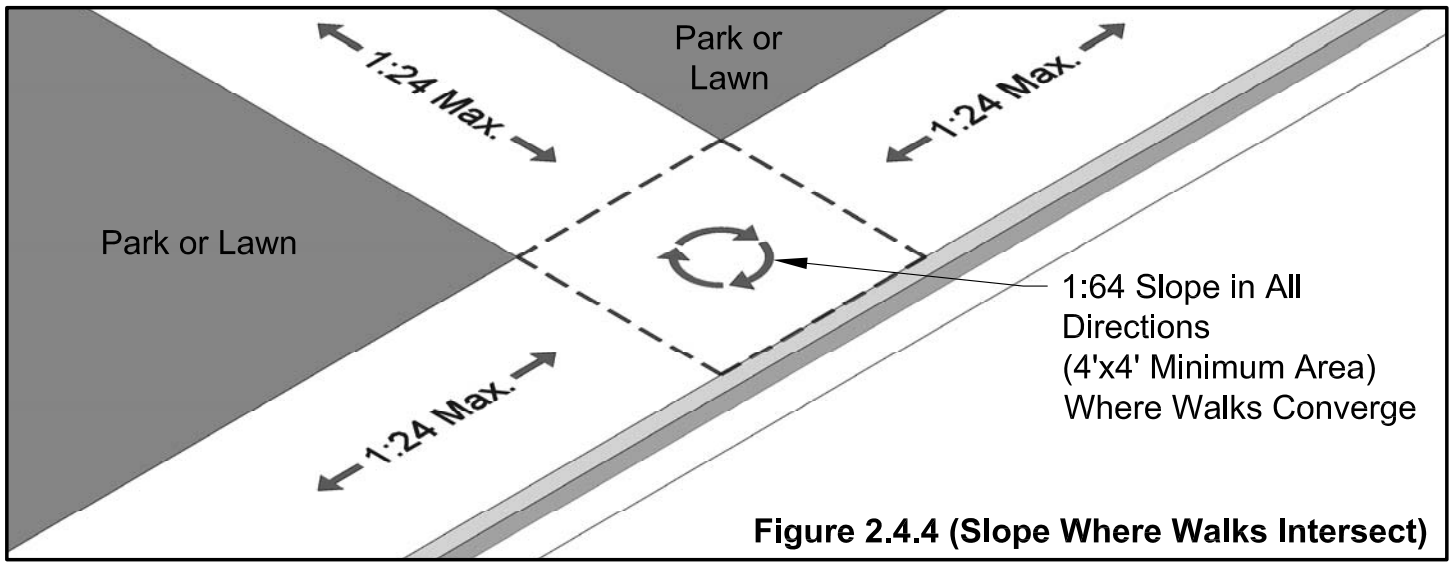


Figure 2.4.4 (Slope Where Walks Intersect)

2.5 Accessible Routes - Obstructions

The pedestrian access route must be clear of obstructions from above or that protrude horizontally into the route.

It is important to keep the pedestrian access route clear of obstructions, particularly for the visually impaired or blind pedestrian. The blind individual typically uses a long white cane to identify obstructions above by locating the source below. If the source of the obstruction is located 27 inches or more above the pedestrian surface, it may not be detected by the blind pedestrian. Where wall-mounted objects are located within the range of 27-80 inches above the sidewalk, they must not project horizontally more than 4 inches. Objects projected more than 4 inches require a provision of adequate cane detection below and continuously for the length of the projection.

Canopies, signage, tree branches, or any other element overhanging the pedestrian way must be located at a minimum of 80 inches above. Obstructions located below 80 inches can be challenging for all pedestrians.

If signage or other post-mounted objects are located in the public way, they must not extend more than 12 inches horizontally from mounting post (where the bottom of the sign is located between 27 inches and 80 inches above the walking surface). The blind pedestrian can detect the base of the post with a cane, but the horizontal projection above must be limited since detection is not feasible for this individual.

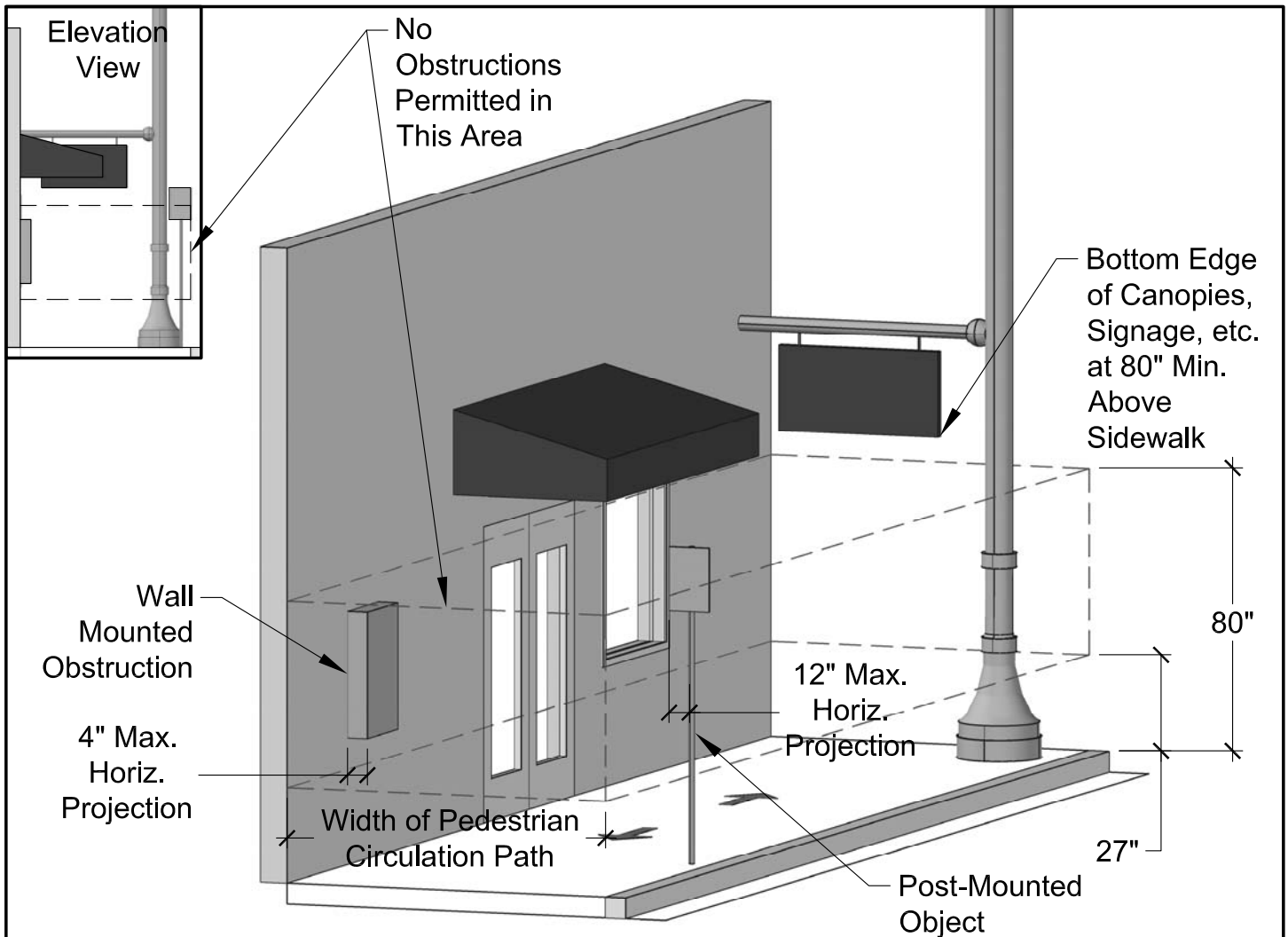


Figure 2.5.1 (Obstructions)

2.6 Accessible Routes - Sidewalk Ramps & Stairs

2.6.1 Sidewalk Ramps

The running slope on sidewalks should be kept at a minimum for a safe and accessible pedestrian route. At times a sidewalk may follow the adjacent roadway, overpass or bridge slope, and in this case it is acceptable practice for the sidewalk slope to match the established grade for these conditions if the normal maximum running slopes (1:24) cannot be applied.

In certain circumstances, there may be a need to ramp the sidewalk in the public way to provide adequate access for pedestrians. **The requirements of these ramps differ from those of curb ramps;** when a ramp is necessary, all pertinent building codes or construction requirements must be strictly followed.

The following is a brief summary of the requirements of an accessible ramp per ADAAG/PROWAG (refer to Figures 2.6.1 - 2.6.3 for additional information):

Ramps

- **Running Slope:** 1:12 maximum.
- **Cross Slope:** 1:48 maximum.
- **Clear Width:** 3 feet minimum (clear between the handrails).
- **Rise:** 30 inches maximum (per ramp run)
- Ramps with a rise greater than 6 inches must have handrails (curb ramps excluded); refer to Section 2.6.3 for handrail requirements.

Ramp Edge Protection

Edge protection on a ramp is either a low rail or a curb to keep wheelchairs and other objects from straying off of the surface of the ramp. Edge protection is not required if the surface adjacent to the ramp is flush with the ramp or if a wall is located adjacent to the ramp. (Figures 2.6.1 - 2.6.3)

- **Where Required:** Ramps requiring handrails must have edge protection on each side of ramp runs and ramp landings.
- **Where not Required:** Edge protection not required on the sides of ramp landings serving an adjoining ramp run or stairway.

Ramp Edge Protection (cont.)

- **Where not Required:** Edge protection not required on the sides of ramp landings having a vertical drop-off of 1/2 inch maximum within 10 inches horizontally of the minimum landing area.
- **Where not Required:** Edge protection not required where ground surface of the ramp or landing extends 12 inches minimum beyond the inside face of the handrail.
- **Acceptable Edge Protection:** A curb or barrier shall be provided that prevents the passage of a 4 inch diameter sphere, where any portion of the sphere is within 4 inches of the finish floor or ground surface.

Ramp Landings

- **Top and Bottom of Ramps**
- **Slope:** 1:48 maximum in all directions.
- **Clear Width:** Matches width of ramp (clear of the handrails, 3 feet min.).
- **Length:** 5 feet minimum.
- **Change in Direction:** Ramps that change direction (intermediate landing) must include a 5 feet x 5 feet minimum landing (clear of handrails).

Where it is necessary to provide a ramp for access, it may be beneficial to also provide accessible stairs as well. Some pedestrians may find stairs easier or more convenient to negotiate than a long switchback type ramp. (Figure 2.6.1)

Note: Ramp and stair installation within the public way is a rare occurrence. Refer to applicable building code requirements as well as ADAAG & PROWAG for additional information. These situations and designs must be approved.

Note: Building codes typically require surfaces separated by significant elevation differences be protected by guardrails. (Figure 2.6.1, next page)

2.6.1 Sidewalk Ramps (cont.)

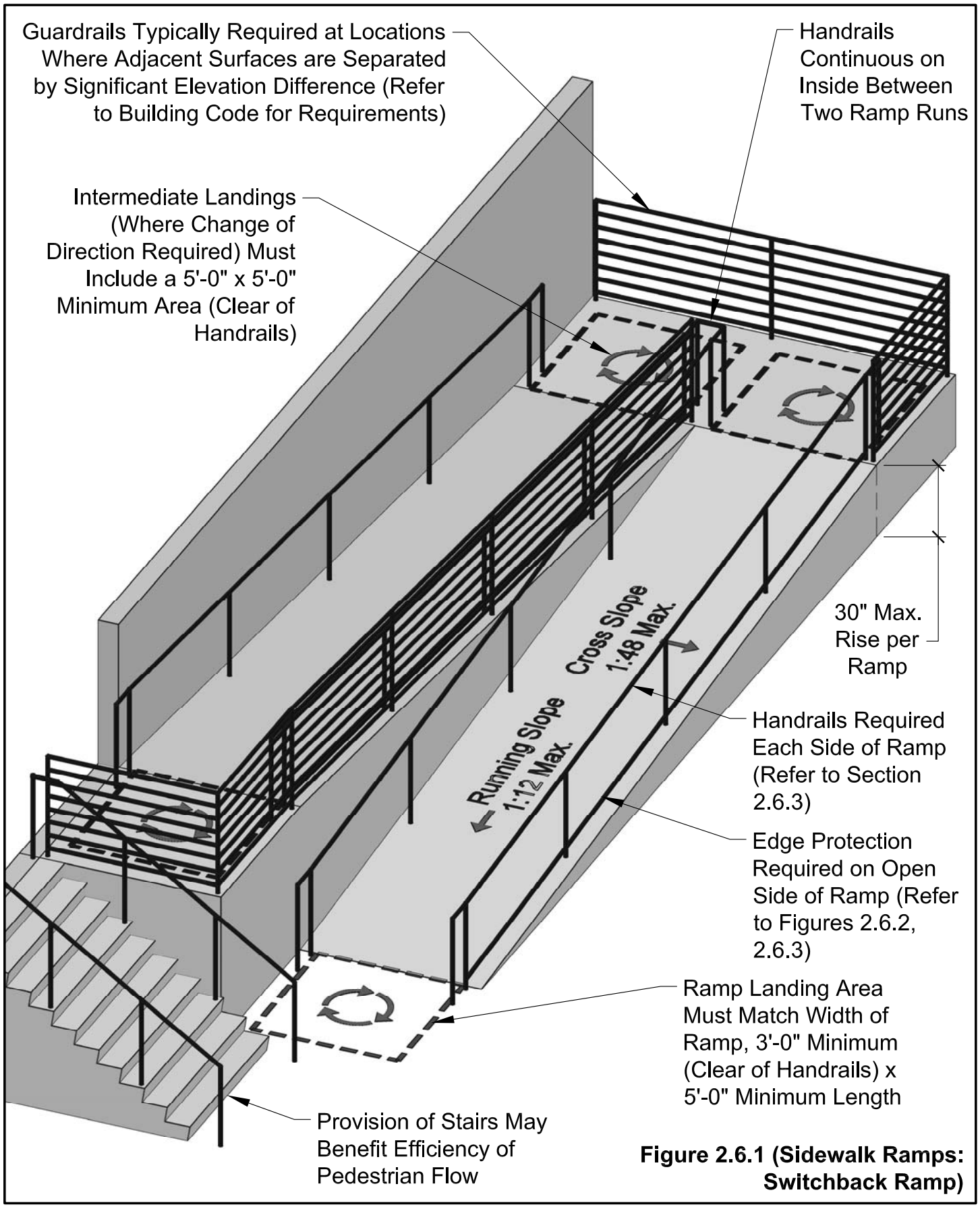


Figure 2.6.1 (Sidewalk Ramps: Switchback Ramp)

2.6.1 Sidewalk Ramps (cont.)

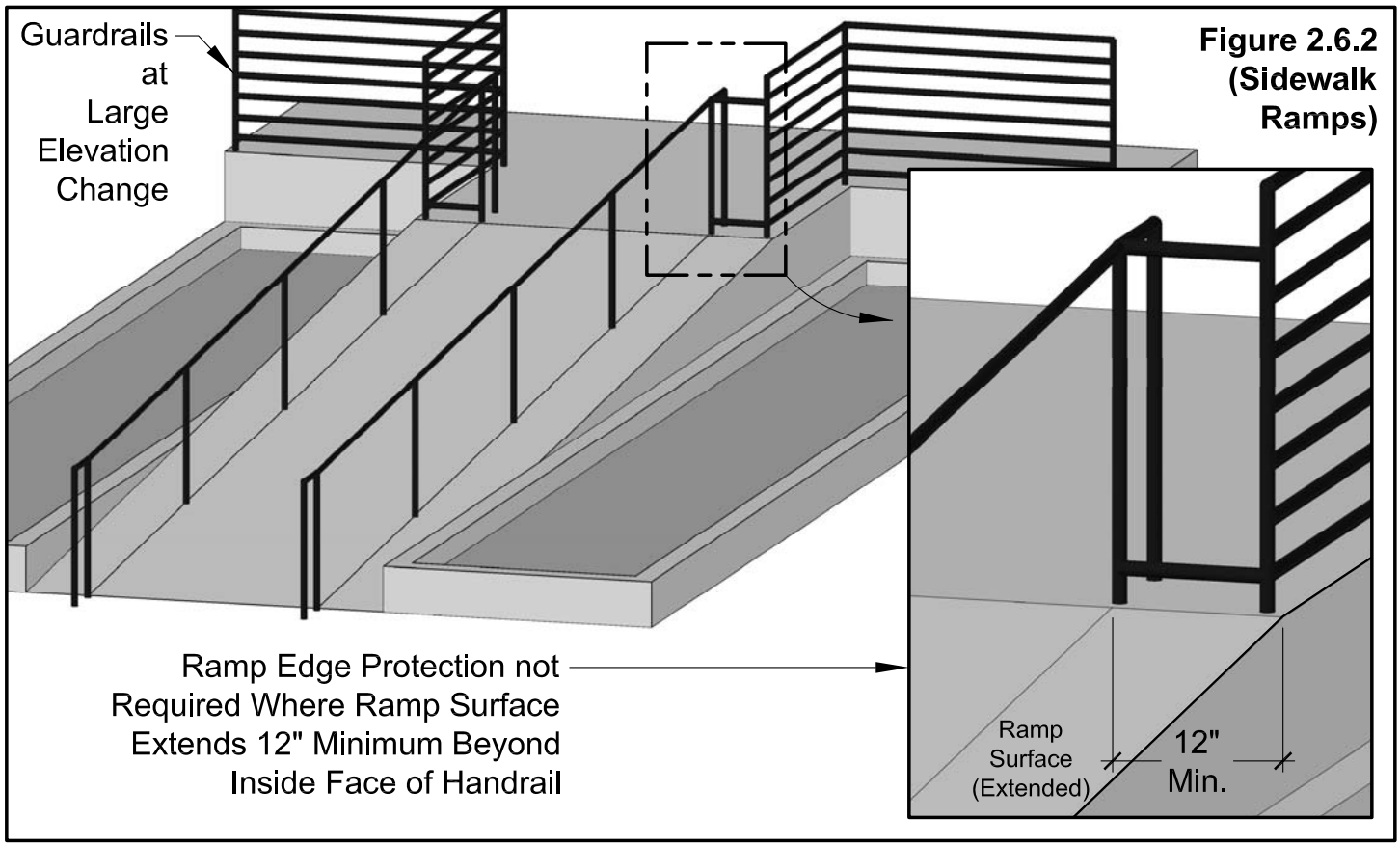


Figure 2.6.2 (Sidewalk Ramps)

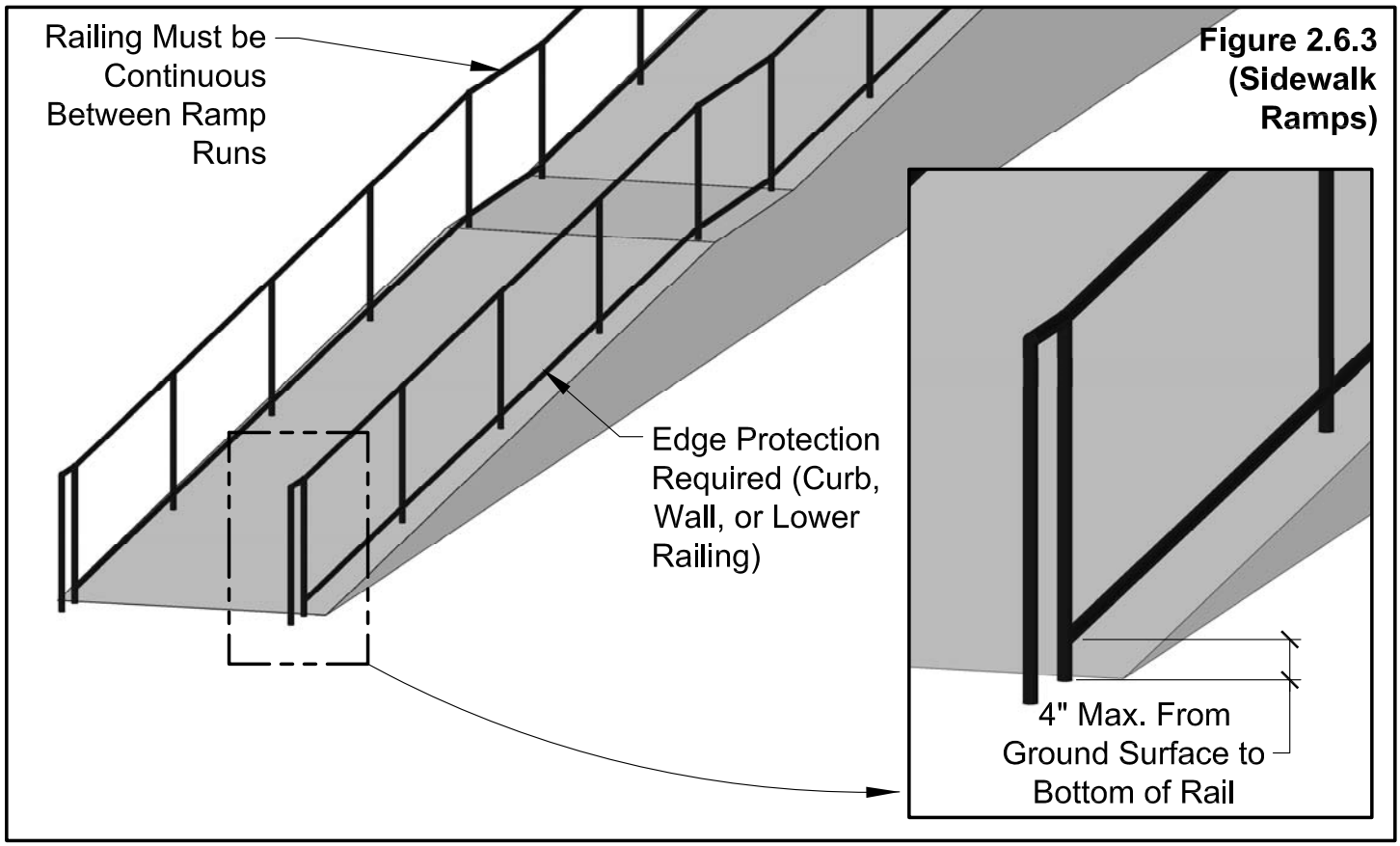


Figure 2.6.3 (Sidewalk Ramps)

2.6.2 Stairs in the Public Way

Because stairs are inaccessible to wheelchair users, stair installation in the public way should be avoided. However, if stair installation is necessary, they must be built to be as accessible as possible. Pedestrians with crutches, for example, may be able to negotiate stairs if built in a compliant way. Where a stairway is necessary, all pertinent building codes or construction requirements must be adhered to. The illustrations in this guide with regards to stair requirements reflect the maximum and minimum dimensions and slopes for accessible stairs required by ADAAG & PROWAG.

The following is a brief summary of the requirements for accessible stairways per ADAAG/PROWAG (refer to Figures 2.6.4 - 2.6.6 for additional information):

Stairs

- Risers: 4 inches minimum and 7 inches maximum (Note: All steps on a flight of stairs shall have uniform riser heights).

- Treads: 11 inch minimum depth (Note: All steps on a flight of stairs shall have uniform tread depths).

- Open Risers: Not permitted.

- Tread Surface (General): Must satisfy the requirements of an accessible route (refer to Section 2.0); slope shall not exceed 1:48.

- Tread Surface (Detectability): Stairway treads shall have a 2 inch minimum wide strip that contrasts visually with the tread and riser, located at the front of each tread and running full width of the tread.

- Nosings: The radius of curvature at the leading edge of the tread shall be 1/2 inch maximum. Nosings that project beyond risers shall have the underside of the leading edge curved or beveled. Risers shall be permitted to slope under the tread at an angle of 30 degrees minimum from vertical. The permitted projection of the nosing shall extend 1-1/2 inches maximum over the tread below.

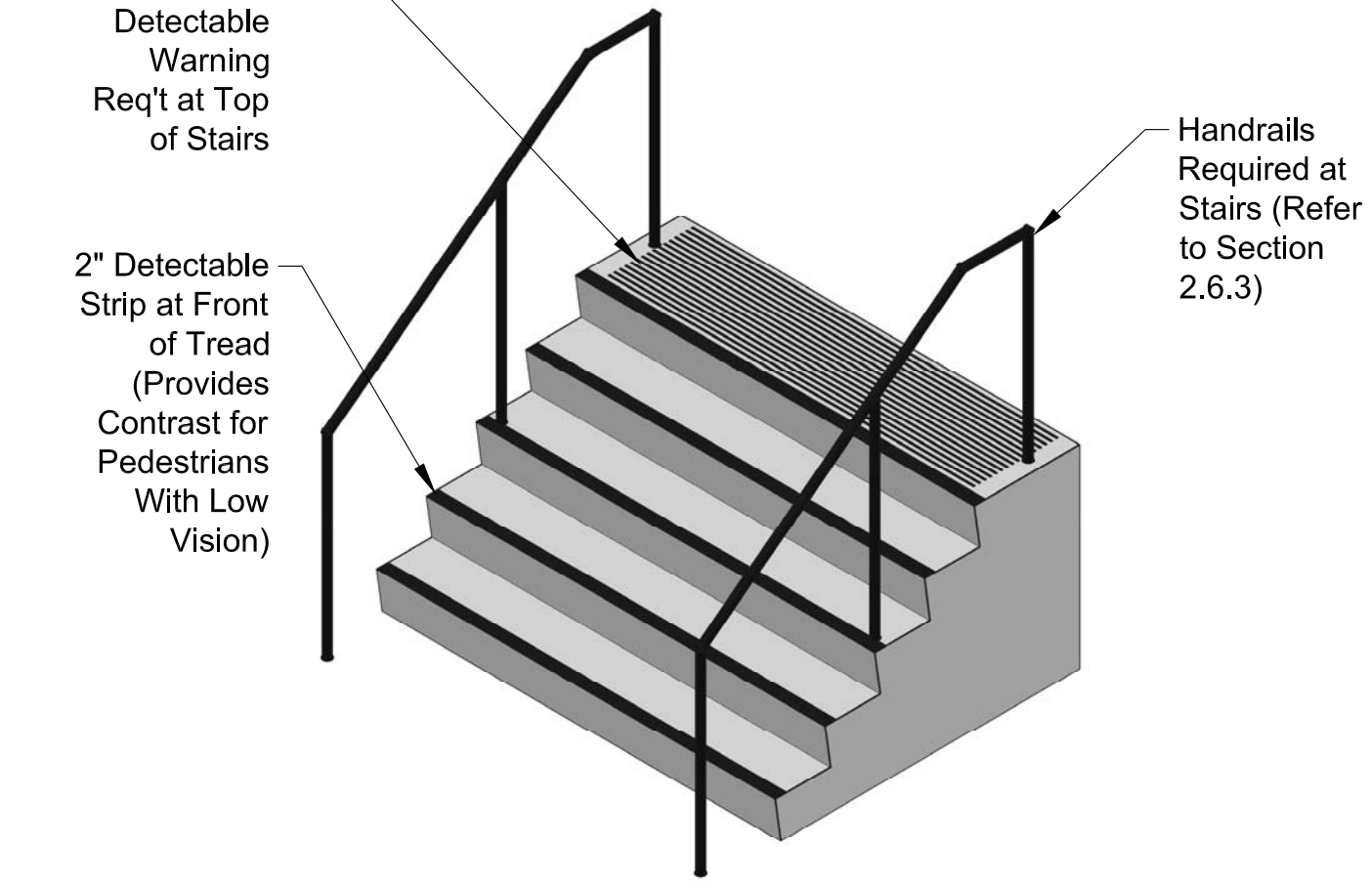
- Handrails: Stairs Shall Have Handrails (Refer to Section 2.6.3 for handrail requirements).

Note: Ramp and stair installation within the public way is a rare occurrence. Refer to applicable building code requirements as well as ADAAG & PROWAG for additional information. These situations and designs must be approved.

Note: Refer to building code for detectable warning requirements to be provided at the top of the stairs for pedestrians with visual impairments.

2.6.2 Stairs in the Public Way (cont.)

Figure 2.6.4 (Sidewalk Stairs)



Note: Riser & Tread Dimensions Do Not Include the Nosing of the Stair

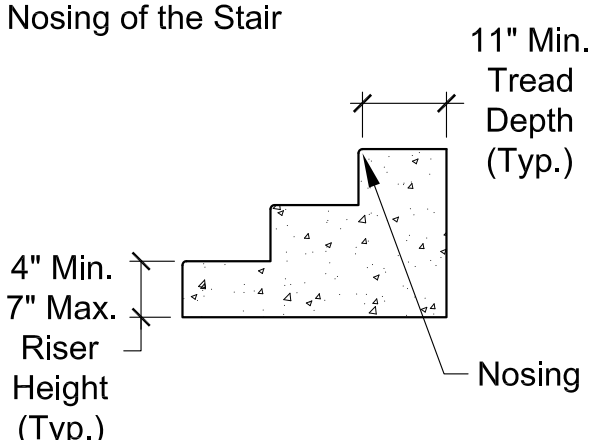


Figure 2.6.5 (Sidewalk Stairs)

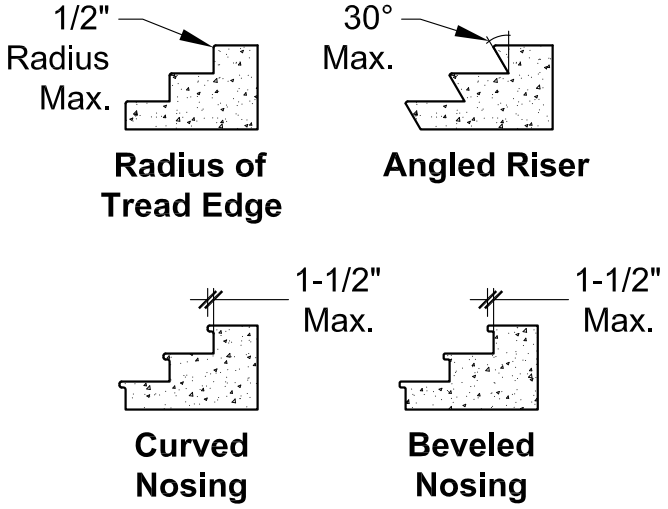


Figure 2.6.6 (Sidewalk Stairs)

2.6.3 Handrails

Handrails that are required at ramps and stairs can also be used as a device to protect a small ledge or an elevation change in the public way. Handrails can assist pedestrians in a safe negotiation of a ramp or stairway. The handrails can also define a ramped surface by helping to contain a wheeled device within the limits of the ramp. Handrails are not typically applied at curb ramp locations.

When handrails are necessary, all pertinent building codes or construction requirements must be adhered to. The illustrations in this guide with regard to handrail requirements reflect the maximum and minimum dimensions and slopes for accessible handrails required by ADAAG & PROWAG.

The following is a brief summary of the requirements of accessible handrails per ADAAG/PROWAG (refer to Figures 2.6.7 - 2.6.10 for additional information):

Handrails

- Locations Where Required: Both sides of ramps and stairs.

- Continuity: Handrails shall be continuous for the full length of each stair flight or ramp run. Inside handrails on switchback stairs and ramps shall be continuous between flights or runs.

- Height: 34 inch min. to 38 inch max. (to top of gripping surface) above walking surfaces, stair nosings, and ramp surfaces. Handrails shall be at a consistent height for entire stair flights or ramp runs.

- Clearance: 1-1/2 inch minimum from handrail gripping surface to adjacent surface (walls, fencing, etc.).

- Gripping Surface: Must be continuous along the length of the handrail and unobstructed along the tops and sides; bottom edge of handrail cannot be obstructed for more than 20% of its length.

- Cross Section (Circular): 1-1/4 inches minimum and 2 inches maximum.

- Cross Section (Non-Circular): Perimeter dimension of 4 inches minimum and 6-1/4 inches maximum, and cross-section dimension of 2-1/4 inches maximum.

- Surfaces: Must be free of sharp or abrasive elements and edges must be rounded.

- Fittings: Handrails must not rotate within their fittings.

Handrail Extensions

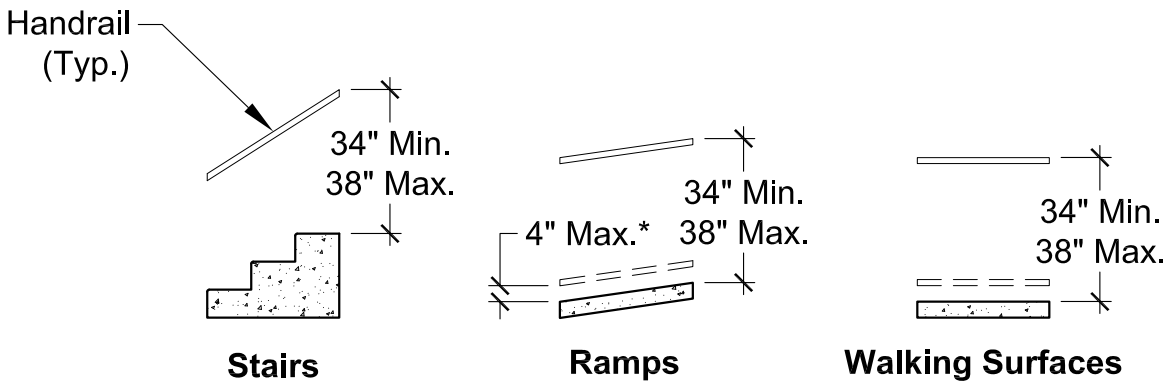
- Extension at Ramps: Ramp handrails shall extend horizontally above the landing for 12 inches minimum beyond the top and bottom of ramp runs. Extensions shall return to a wall, guard, or the landing surface, or shall be continuous to the handrail of an adjacent ramp run.

- Top Extension at Stairways: At the top of a stair flight, handrails shall extend horizontally above the landing for 12 inches minimum beginning directly above the first riser nosing. Extensions shall return to a wall, guard, or the landing surface, or shall be continuous to the handrail of an adjacent stair flight.

- Bottom Extension at Stairways: At the bottom of a stair flight, handrails shall extend at the slope of the stair flight for a horizontal distance at least equal to one tread depth beyond the last riser nosing. Extensions shall return to a wall, guard, or the landing surface, or shall be continuous to the handrail of an adjacent stair flight.

Note: Ramp and stair installation within the public way is a rare occurance. Refer to applicable building code requirements as well as ADAAG & PROWAG for additional information. These situations must be coordinated with CDOT.

2.6.3 Handrails (cont.)



* Where Bottom Rail is Used for Required Ramp Edge Protection

Figure 2.6.7 (Handrails)

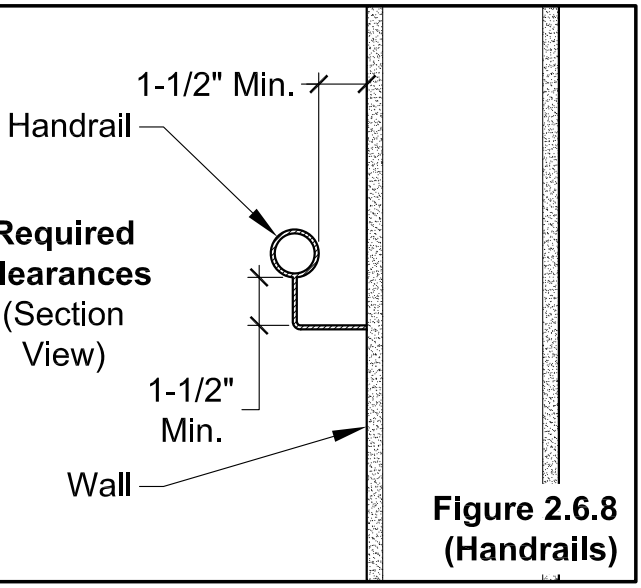


Figure 2.6.8 (Handrails)

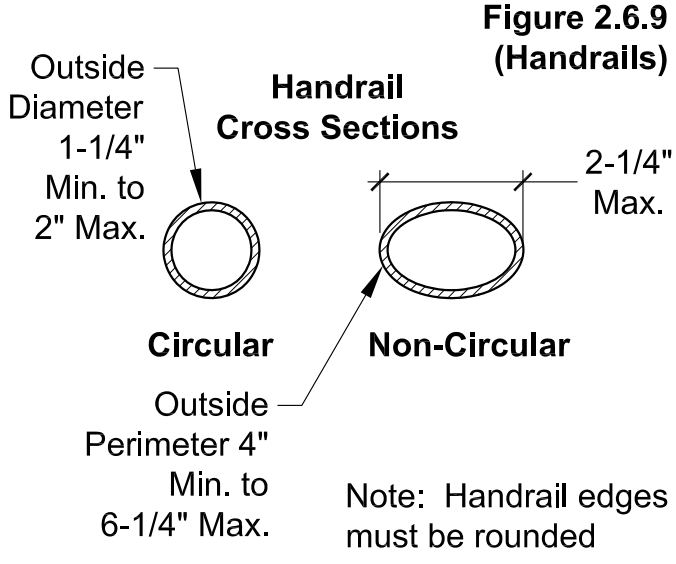


Figure 2.6.9 (Handrails)

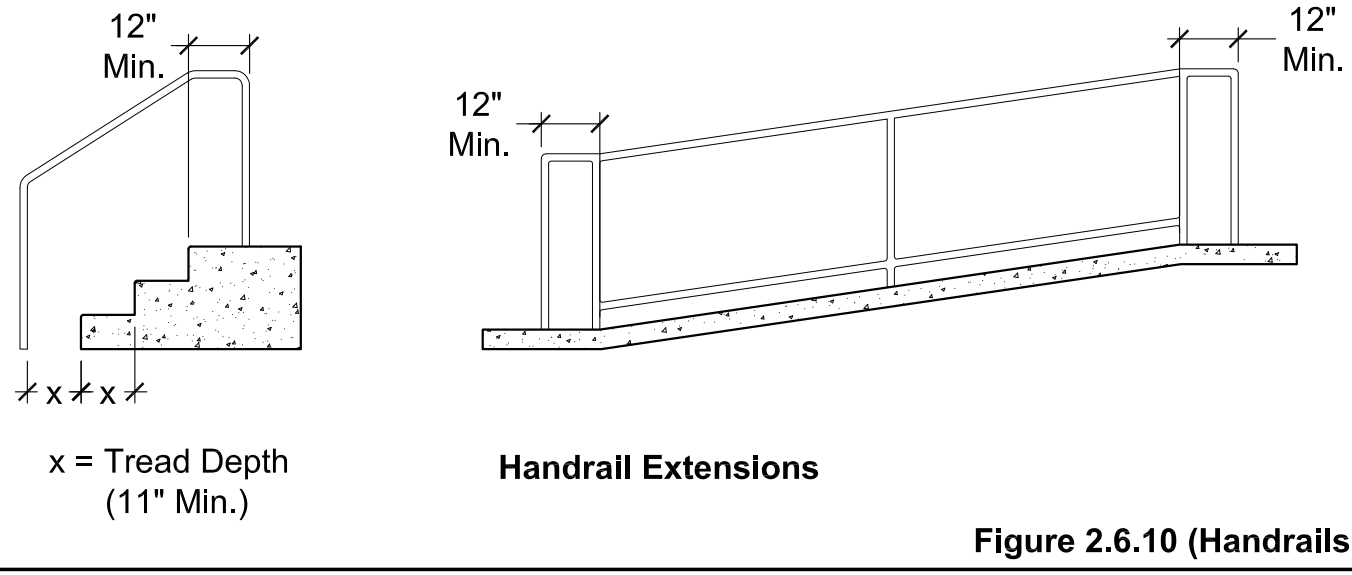


Figure 2.6.10 (Handrails)

3.0 Curb Ramps

3.1 Curb Ramps - Overview

3.1.1 Connecting Sidewalk With Street

The curb ramp, a gradually sloped sidewalk connecting the sidewalk to the street, is a very important element of the public way. Without functional and accessible curb ramps, general pedestrian flow can become restricted for some pedestrians; without access to street crossings, a complete pedestrian circulation network is compromised. **Street crossings, whether striped or not, must be made available to all pedestrians.**

Accessible curb ramps can be very challenging to provide for in existing as-built environments for design and construction professionals. Requirements are in place to provide the best and safest pedestrian way that can accommodate any number of pedestrians with differing needs. Proper slopes, landing areas and detectable warning surface must be consistently applied to the ramps to assist those with mobility or vision impairments.

Historically, curb ramp construction, while appearing accessible, has proven to be difficult to use and in extreme instances even hazardous for some pedestrians. Current design requirements and guidelines are aimed at true accessibility -- not the appearance of accessibility.

3.1.2 Regulation & Enforcement

The curb ramp is the only feature located in the right-of-way with specific requirements in the Americans with Disabilities Title II regulation. Curb ramps are required to be provided, whether by new construction or alteration, at intersections with with curbs or other barriers. Refer to Section 9.0 for specific scoping requirements.

Program access is one requirement outlined in Title II of the ADA. Program access is the responsibility of a state or local government to provide access to public programs to people with disabilities. In other words, access cannot be denied to public programs to people with disabilities. When pedestrian circulation is viewed as a public program or as a means of access to a public program offered by a municipality, the curb ramp becomes a key feature of that pedestrian circulation.

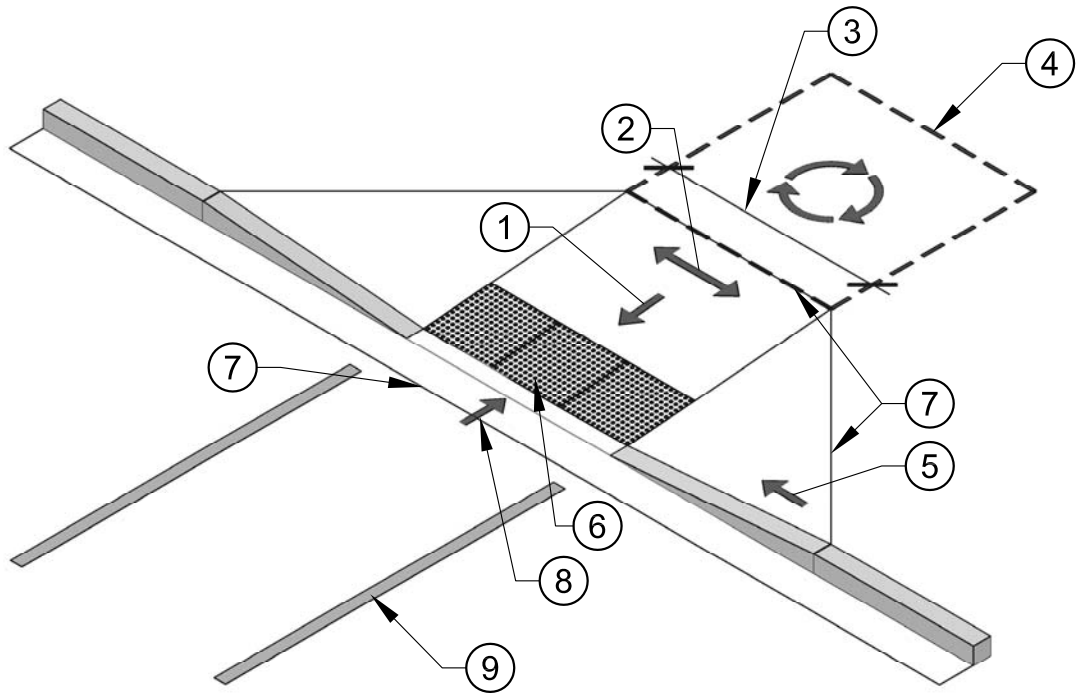
3.1.3 Typical Curb Ramp Requirements

In addition to the surface requirements of an accessible route (Section 2.3), refer to the illustration on page 23 to understand what other elements make up a typical accessible curb ramp. (Figure 3.1.1)

Different types of ramp configurations (perpendicular ramps, parallel ramps, combination ramps) are discussed in further detail in Sections 3.2 - 3.4. Detectable warning placement is covered more thoroughly in Section 4.0.

3.1 Curb Ramps - Overview (cont.)

1. **Curb Ramp Running Slope**
2. **Curb Ramp Cross Slope**
3. **Curb Ramp Width**
4. **Curb Ramp Landing**
5. **Curb Side Flares (Where Applicable)**
6. **Detectable Warning**
7. **Transitions to Adjacent Surfaces**
8. **Counterslope**
9. **Marked Pavement Crosswalk (Where Applicable)**



Note: Refer to Additional Information on the Following Pages for Specific Requirements and Design Considerations for These Basic Curb Ramp Elements

(Typical Ramp Elements & Checks) Figure 3.1.1

3.1.4 Curb Ramp Elements

Pedestrians utilizing the public way have varying levels of mobility. Those pedestrians with mobility impairments may be assisted by devices that also provide varying levels of mobility. In some cases, it may not be possible for a curb ramp to completely satisfy the needs of all pedestrians, but it is important to fully understand the elements which make up the curb ramp in order to design the best possible option.

Curb Ramp Running Slope

Curb ramp running slope is the degree of slope that is encountered when traveling up or down the ramp. Where a connection from the sidewalk to the street is designed and constructed, a minimal running slope is desirable. Conversely, an established maximum running slope on a curb ramp is crucial to maintaining usability and accessibility for all pedestrians. Therefore the running slope must be limited to 1:14 maximum (1:12 max.*). (Figures 3.1.2, 3.1.3)

In alterations to the existing as-built environment, the following curb ramp running slopes are permitted only when absolutely necessary:

Allowable Running Slope	Maximum Ramp Vertical Rise
1:10*	6"
1:8*	3"

(Figure 3.1.4)

These slopes are the maximums allowed by federal criteria, and under no conditions may they be exceeded.

The CDOT standard running slope maximum of 1:14 may be used for a maximum length of 15 feet in order to meet the existing sidewalk, when necessary. Lengths of long, steep running slopes beyond 15 feet are discouraged.

It should be noted that pedestrians with visual impairments use the running slope of the ramp as just one of a set of cues that help in establishing orientation. If a ramp or other connection to the street is provided, the orientation of detectable warning tiles may need to be modified in the layout to help orient the blind or visually impaired. Refer to Section 4.0 for additional information.

Grade breaks on ramps must always be perpendicular to the path of travel.** Wheelchairs may become unstable when wheels are unable to meet the grade break simultaneously. Each ramp length should be equivalent in length and parallel to one another. Otherwise, a wheelchair user must perform the taxing maneuver of turning while ascending the ramp. If the running slope of the sidewalk or connection to the street level is less than 1:20, the grade breaks need not be perpendicular to the path of travel. Refer to Figures 3.1.2 and 3.1.3 for examples of ramp grade breaks at the top and bottom of a ramp.

* This dimension or condition may be applied only in alterations to the existing as-built environment when the CDOT standard is not technically feasible or cannot be implemented without creating an unfavorable design solution.

** A ramp is defined by a walking surface with a running slope greater than 1:20.

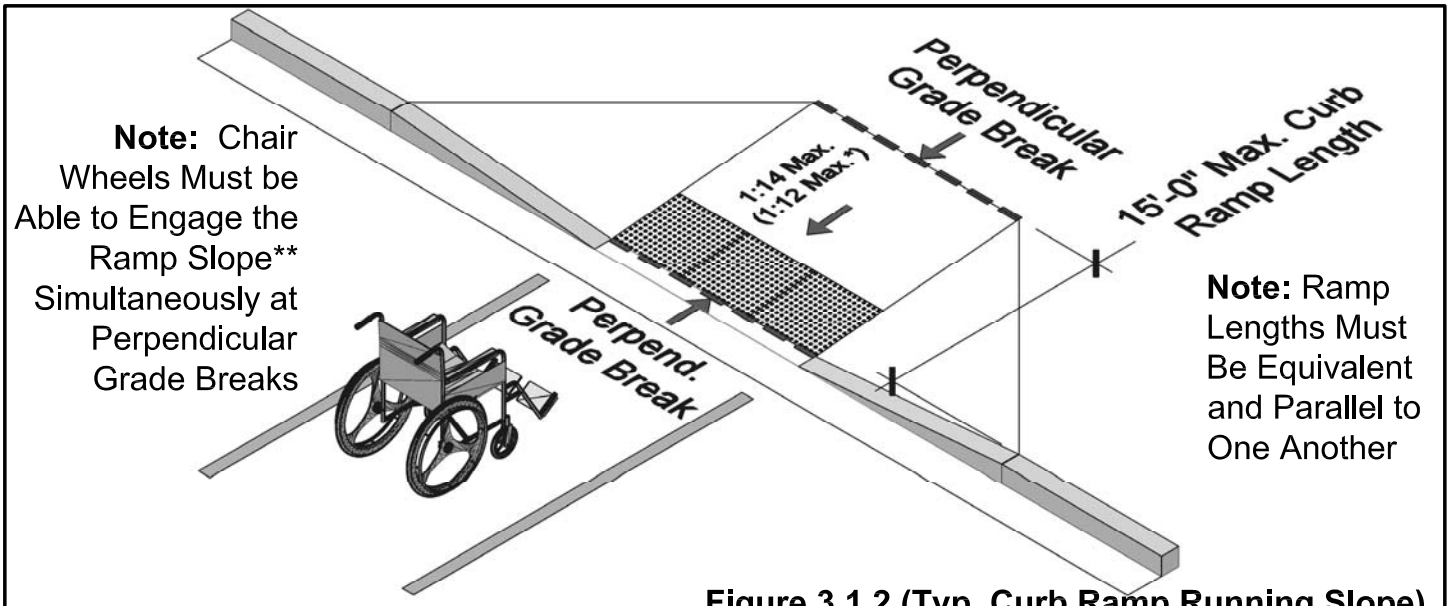


Figure 3.1.2 (Typ. Curb Ramp Running Slope)

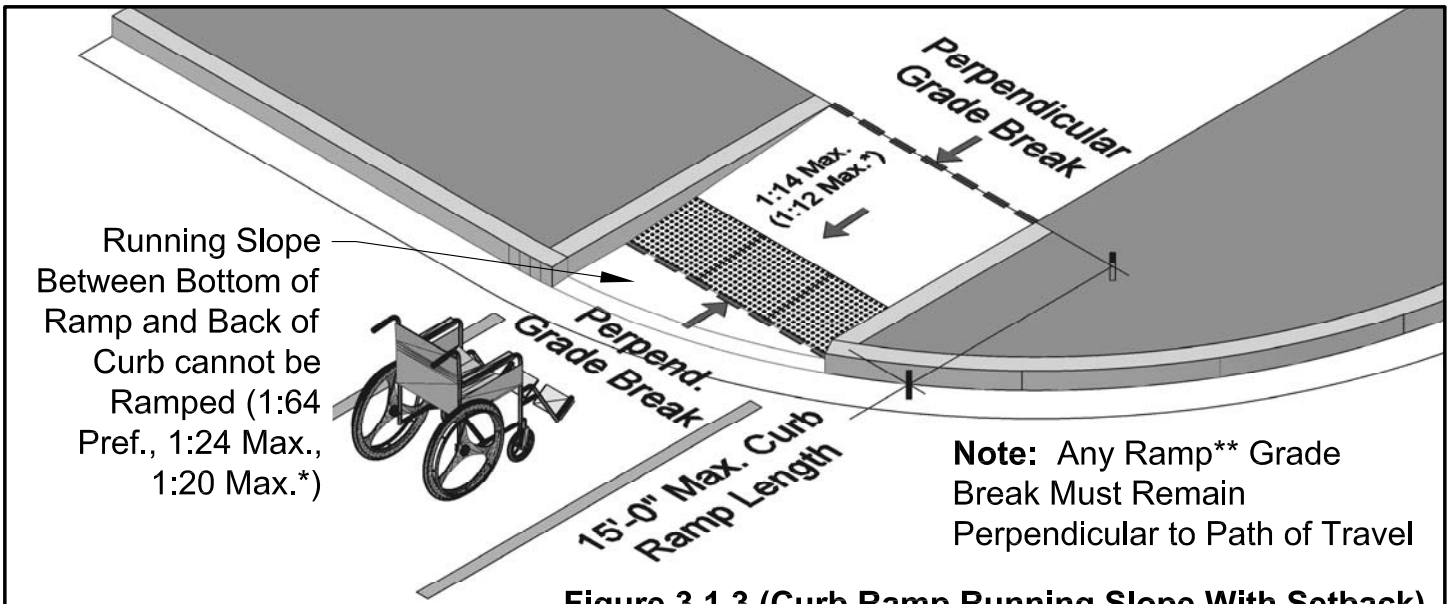


Figure 3.1.3 (Curb Ramp Running Slope With Setback)

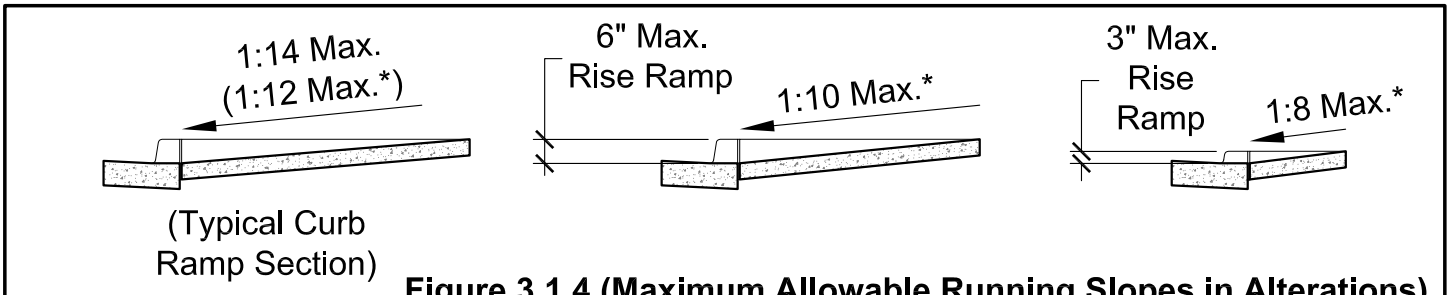


Figure 3.1.4 (Maximum Allowable Running Slopes in Alterations)

* This dimension or condition may be applied only in alterations to the existing as-built environment when the CDOT standard is not technically feasible or cannot be implemented without creating an unfavorable design solution.

** A ramp is defined by a walking surface with a running slope greater than 1:20.

Curb Ramp Cross Slope

Excessive cross slope can be a challenge for pedestrians to cope with, whether they are on a ramp surface or the mainline sidewalk surface. Pedestrians using mobility aids such as crutches, walkers, and wheelchairs may be forced to expend unnecessary energy stabilizing themselves from side-to-side while attempting to travel forward. In addition to the difficulties of stabilization on an excessive cross slope the matter is further complicated when the surfaces become slippery or unstable. A surface with excessive cross slope covered with ice can be a hazard to all pedestrians.

Any mobility difficulties associated with excessive cross slopes are even more evident when a ramp surface is involved. A wheelchair user may be forced to push up a slope while fighting the cross slope at the same time. This requires the disable pedestrian to turn while ascending, which is a difficult and exhausting maneuver. (Figure 3.1.5)

The cross slope of a curb ramp cannot exceed 1:64 maximum (1:50 max.*) for the entire length of the ramp. Where turns or maneuvering are required, the slope must be 1:64 maximum (1:50 max.*) in all directions. (Figure 3.1.6)

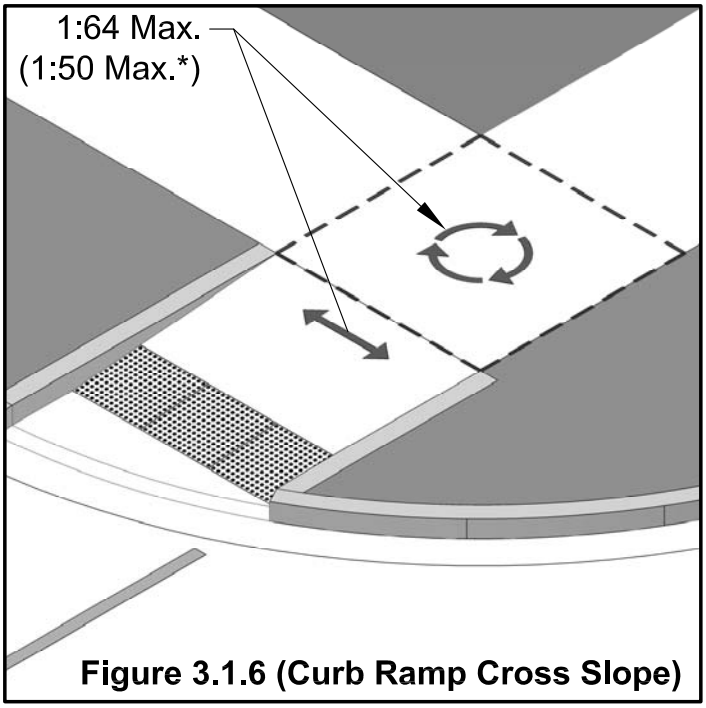
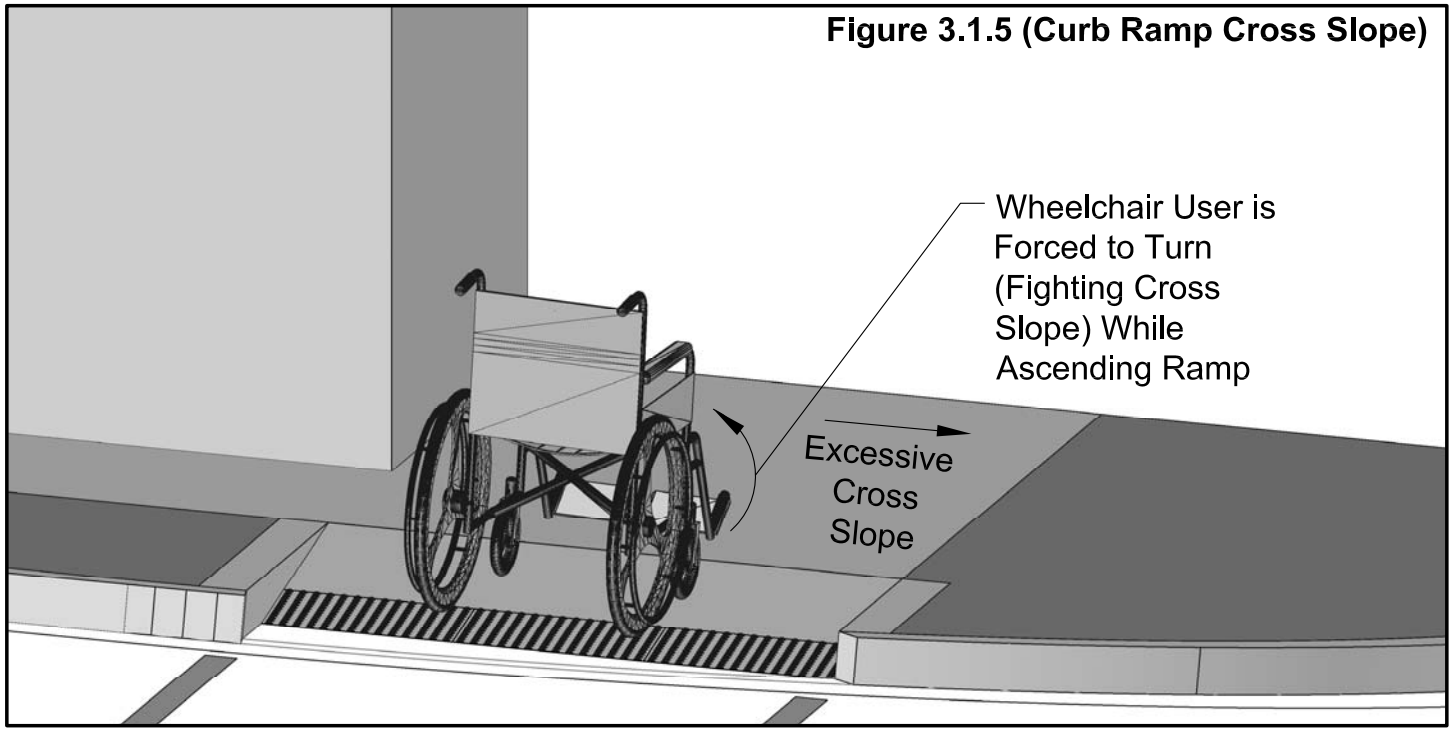


Figure 3.1.6 (Curb Ramp Cross Slope)

Figure 3.1.5 (Curb Ramp Cross Slope)



* This dimension or condition may be applied only in alterations to the existing as-built environment when the CDOT standard is not technically feasible or cannot be implemented without creating an unfavorable design solution.

Curb Ramp Width

The preferred width of a curb ramp is 6 feet, exclusive of the width of the ramp side flare or side curb. Where available right-of-way is limited, curb ramp may be reduced to 4 feet minimum (3 feet min.*). (Figures 3.1.7, 3.1.8) The entire width of the ramp must be free and clear of any barriers or obstructions. Utility structures, signal poles and other fixed objects cannot be located within this 4 foot minimum ramp width. Under no circumstances should the ramp width be less than 3 feet as this is the minimum width required for mobility assistance devices such as wheelchairs. The width of the ramp must be consistent, from top to bottom and the edges of the ramp are to be parallel. (Figures 3.1.7, 3.1.8)

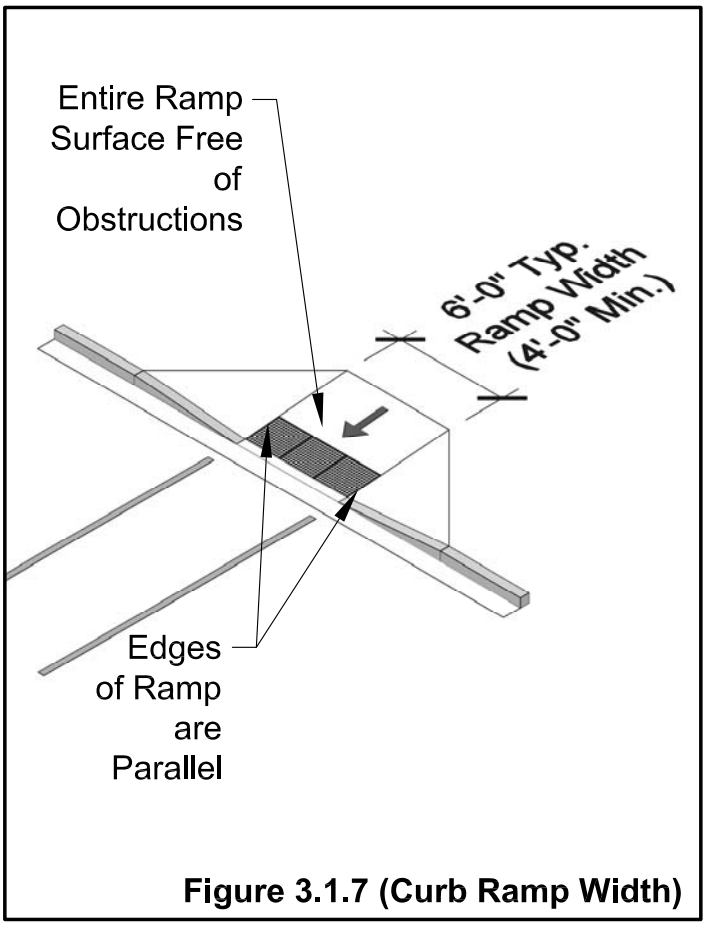


Figure 3.1.7 (Curb Ramp Width)

The width of the curb ramp and sidewalk connecting to a street crossing should be determined independently from the width of the mainline sidewalk. The following variables can affect the determined required width of connection from sidewalk to street crossing:

- **Right-of-Way:** Existing available right-of-way will likely affect the width to be provided for a curb ramp.
- **Curb Ramp Design:** A curb ramp oriented perpendicular to the curb line, for example, will require more width than a curb ramp oriented parallel to the curb line.
- **Existing Elevations:** The curb ramp width may need to be reduced to attain maximum curb ramp length where the existing elevations are steep.
- **Existing Barriers:** Utility pedestals, fire hydrants, signal poles and other barriers can affect curb ramp width.
- **Volume of Pedestrian Traffic:** Areas of higher volume pedestrian traffic may require increasing the width of a curb ramp beyond the typical 6 foot width.

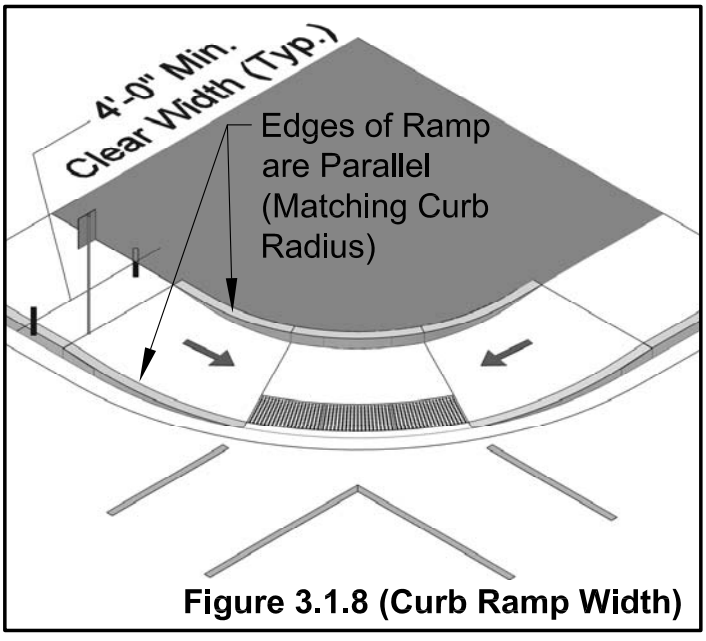


Figure 3.1.8 (Curb Ramp Width)

* This dimension or condition may be applied only in alterations to the existing as-built environment when the CDOT standard is not technically feasible or cannot be implemented without creating an unfavorable design solution.

Curb Ramp Landing Area

Curb ramps must incorporate a level landing area to provide for:

1) Changing direction after ascending the ramp.
2) Resting and preparing for a street crossing.
3) Bypassing the ramp (pedestrians who are traveling around the corner and not making a street crossing).

The slope cannot exceed 1:64 (1:48 max.*) in any direction within the level landing area. The width of the landing area must match the width of the ramp. (Figures 3.1.9, 3.1.10)

Ramp landings are not required at locations where turning is not necessary at the top of the ramp (one-way ramp). The typical sidewalk slope requirements apply at these locations. (Figure 3.1.11)

Refer to Sections 3.2 and 3.4 for additional ramp landing requirements for blended transition ramps and diagonal ramps.

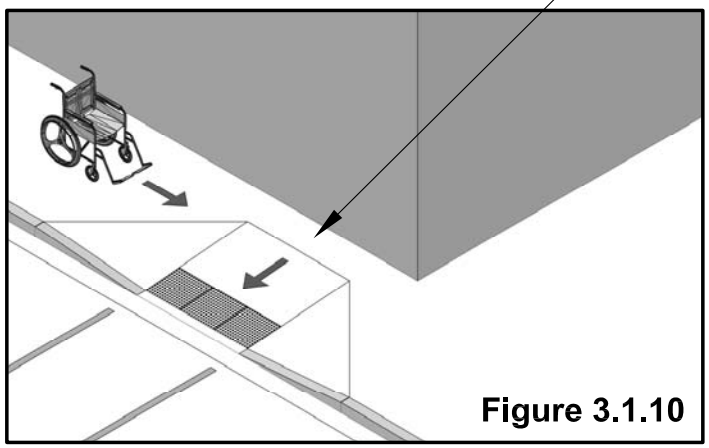


Figure 3.1.10

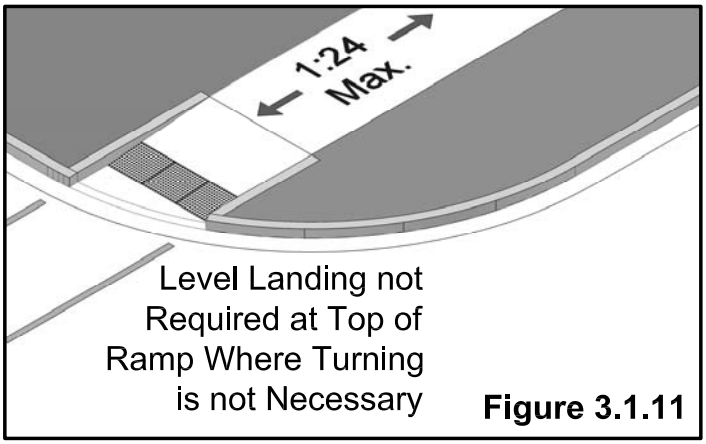


Figure 3.1.11

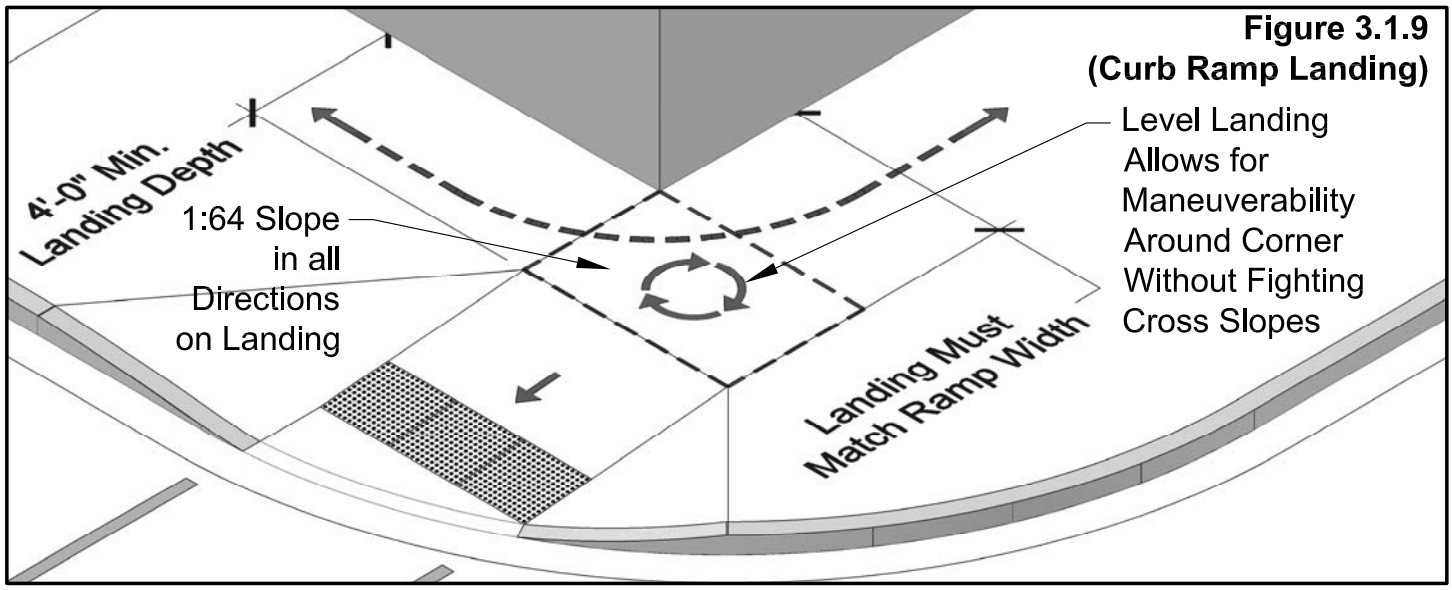


Figure 3.1.9 (Curb Ramp Landing)

* This dimension or condition may be applied only in alterations to the existing as-built environment when the CDOT standard is not technically feasible or cannot be implemented without creating an unfavorable design solution.

Ramp Side Flares

The flared sides a curb ramp are not intended to be part of the accessible route used by pedestrians with mobility impairments. The main purpose for flaring the sides of the ramp is to transition from the ramp surface to the adjacent sidewalk without creating a tripping hazard for pedestrians that may cross the ramped area. There cannot be any ledges, curbs, or drop-offs located in the pedestrian circulation path that would result in such a liability. (Figure 3.1.12)

The slope of side flare cannot exceed 1:12 maximum (1:10 max.*), measured parallel to the curb line.

Where the surface adjacent to a ramped area **IS NOT** a pedestrian circulation path, side flares are not required as there would be no threat of a tripping hazard. A landscaped parkway, for example, would not typically be traversed by pedestrians. A side curb could be installed if necessary or the adjacent landscaping may be regraded to match the ramp slope.

If the surface adjacent to the ramp **IS** a pedestrian circulation path, but is somehow blocked by features such as planter boxes, utility pedestals, fire hydrants, signs or other obstacles, a side flare is not required. In this case, there is no threat of a tripping hazard because the object fully blocks pedestrian access.

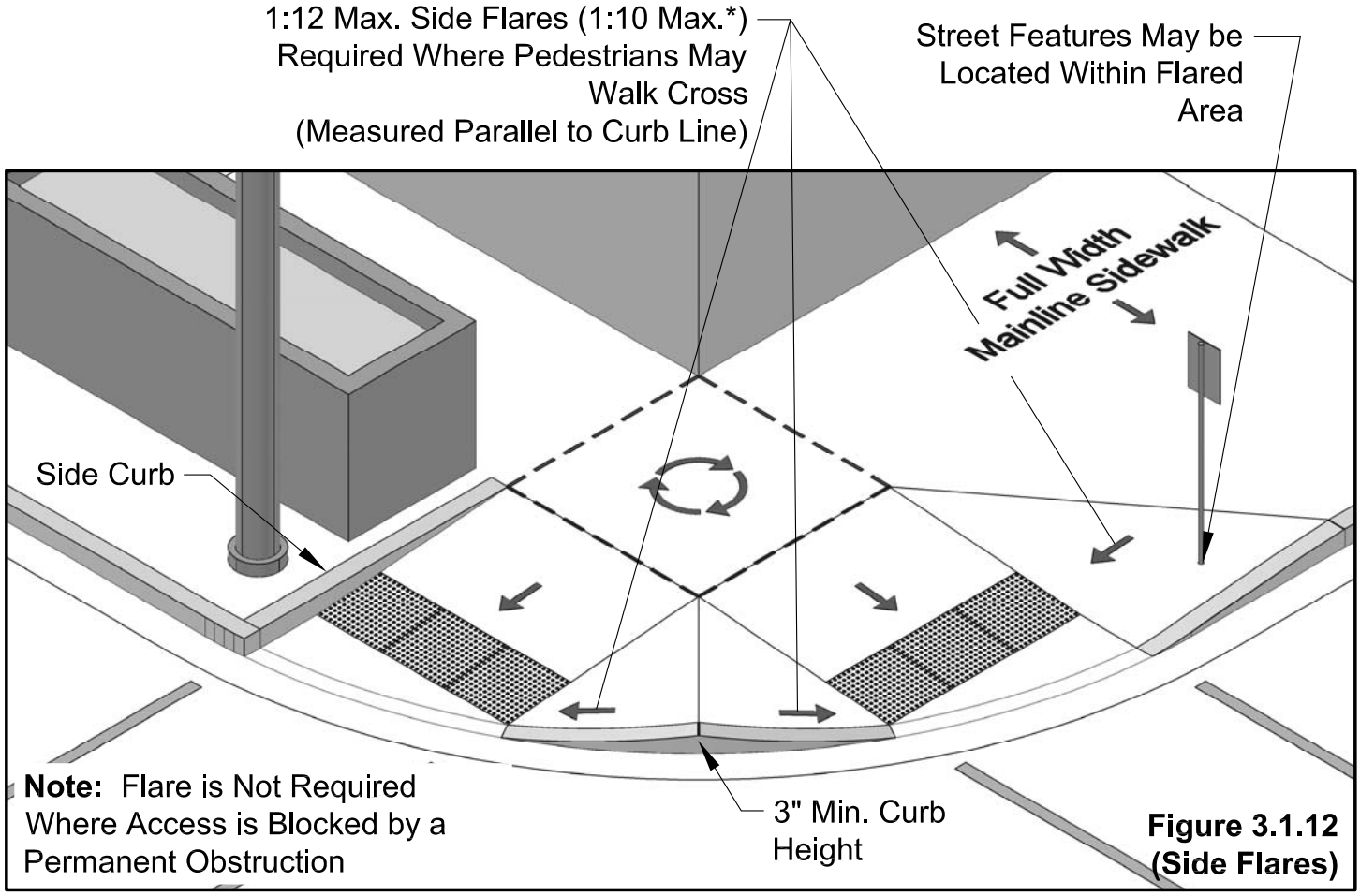


Figure 3.1.12 (Side Flares)

* This dimension or condition may be applied only in alterations to the existing as-built environment when the CDOT standard is not technically feasible or cannot be implemented without creating an unfavorable design solution.

3.1 Curb Ramps - Overview (cont.)

Detectable Warning

The Public Rights-of-Way Accessibility Guidelines (PROWAG) require a detectable warning surface be provided as a part of curb ramp installation. This surface is identified by a pattern of 'truncated' domes that acts as an important cue **to warn the visually impaired pedestrian they may be entering a potentially hazardous area.** The visually impaired can learn to detect this surface by cane or underfoot in combination with other cues when negotiating street crossings.

At a minimum, this detectable warning surface must be provided for a depth of 2 feet for the entire width of the curb ramp and/or the width of the sidewalk that intersects the adjacent vehicular way. This detectable warning is placed at the bottom of the ramp (at the back-of-curb). (Figures 3.1.13, 3.1.14)

Refer to Section 4.0 for detailed information and requirements for detectable warnings.

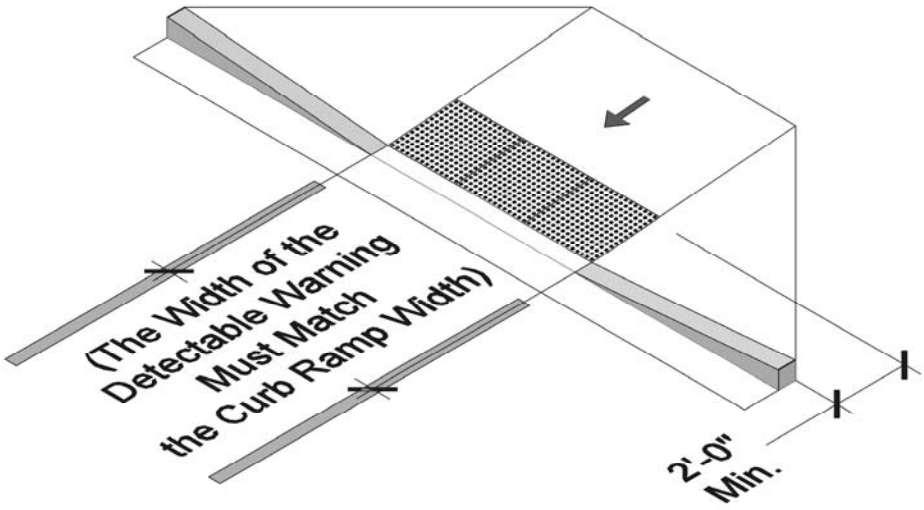


Figure 3.1.13 (Detectable Warning at Curb Ramps)

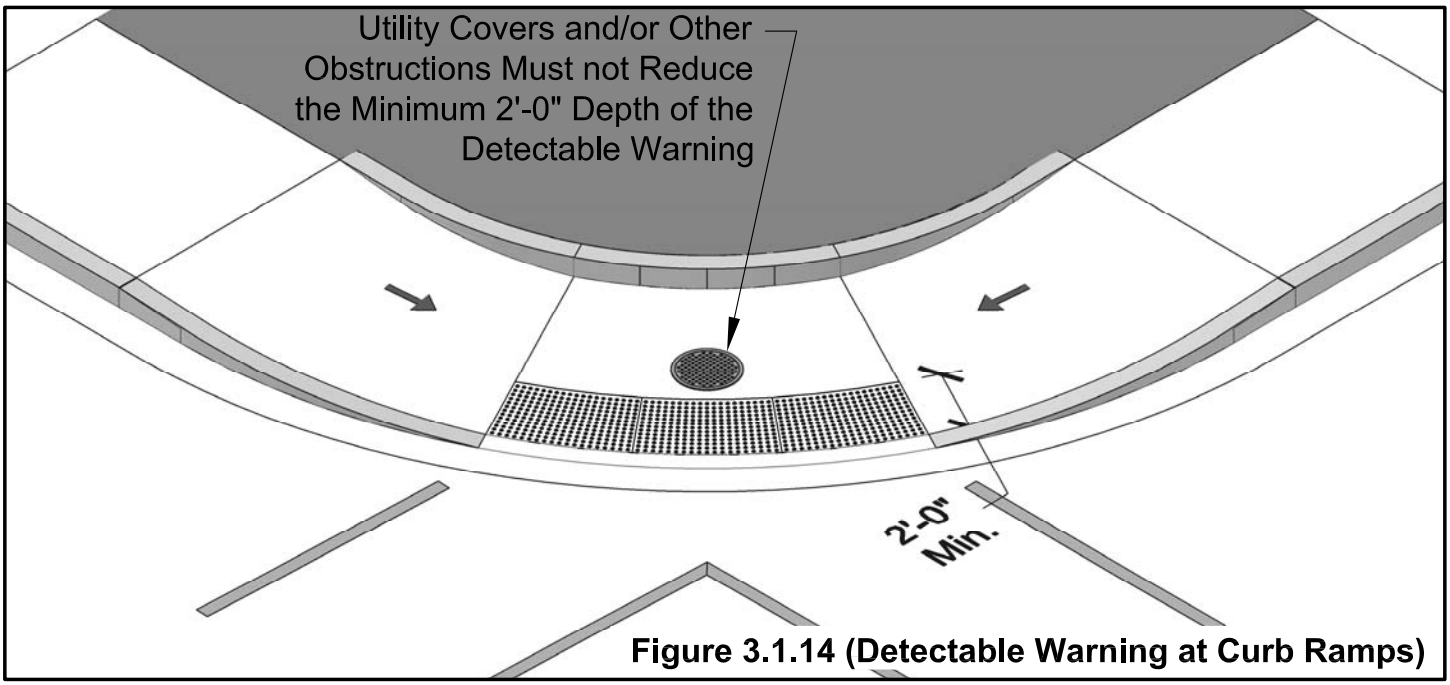


Figure 3.1.14 (Detectable Warning at Curb Ramps)

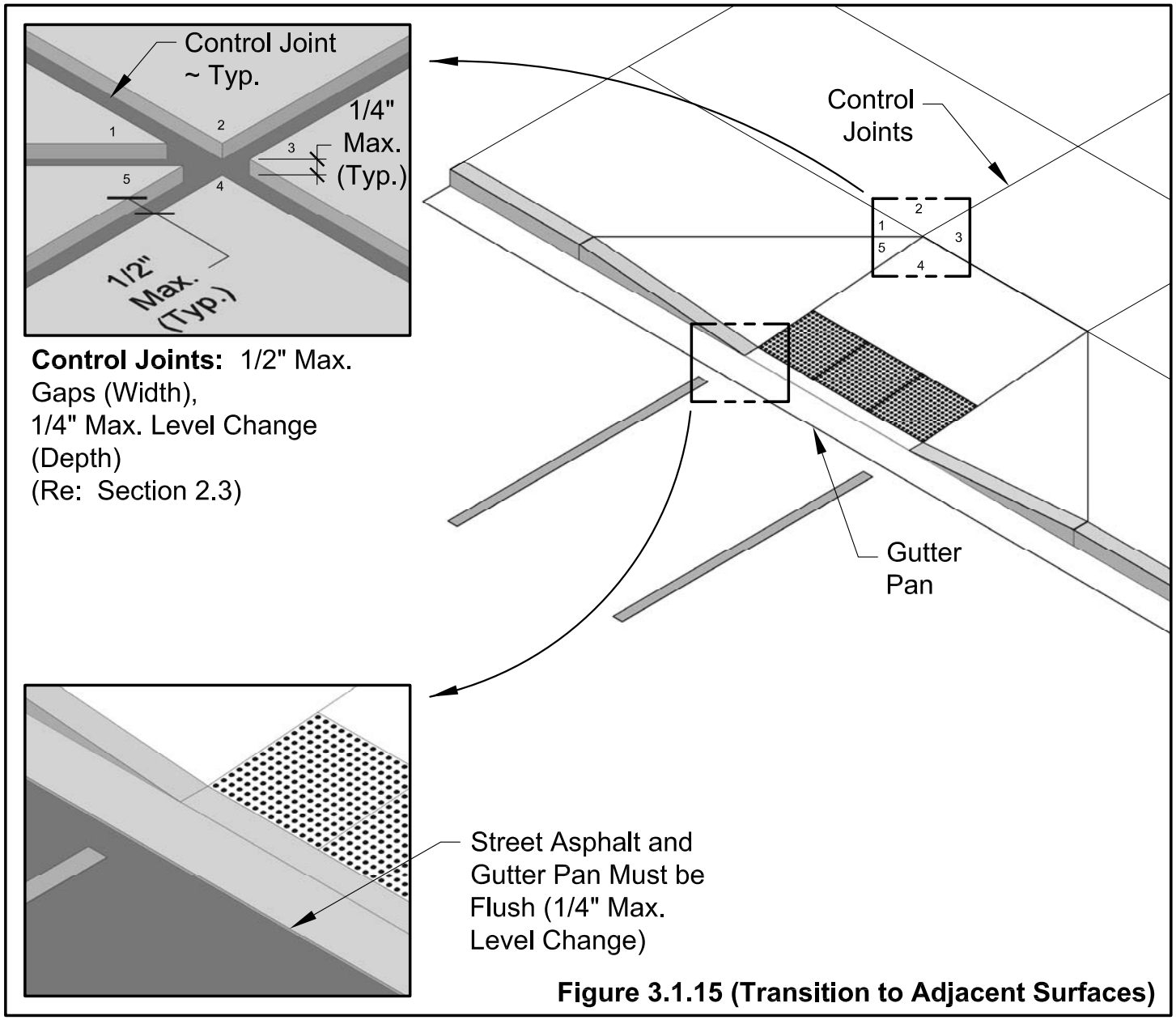
Transitions to Adjacent Surfaces

Similar to the requirements for any accessible route, the connection from the surface of the curb ramp to the adjacent surfaces must be level and barrier-free. (Refer to Section 2.3)

Changes in level from the ramp surface to an adjacent surface cannot exceed 1/4 inch. (Figure 3.1.15)

Control joints separating slabs of sidewalk cannot exceed 1/2 inch maximum, unless the void is occupied by a CDOT approved filler material. (Figure 3.1.15)

Unless absolutely necessary due to existing site constraints, utility covers should not be located on the surface of the curb ramp. If a utility cover is located on the ramp, the level change from the lid to the ramp surface cannot exceed 1/4 inch. (Refer to Section 2.3)



Control Joints: 1/2" Max. Gaps (Width), 1/4" Max. Level Change (Depth) (Re: Section 2.3)

Figure 3.1.15 (Transition to Adjacent Surfaces)

Counterslope

The counterslope, being the slope of any surface that directly opposes the base of the curb ramp, must be limited to a maximum of 1:24 (1:20 Max.*). (Figure 3.1.16). If the counterslope is too great, the footrests of a wheelchair can strike this opposing slope, causing an abrupt stop or potentially sending the pedestrian out of the wheelchair. Ideally, the **algebraic difference** between the ramp slope and counterslope should be maintained at a maximum of 11 percent. This percentage is attained by adding the ramp downslope to the opposing counterslope. (Figure 3.1.18)

The cross slope must be limited to 1:64 maximum (1:50 max.*) through the gutter and the crosswalk.

Where a curb ramp is constructed about a curb radius, and a 'pie piece' shape of concrete is left between the back-of-curb and the bottom of ramp, the same slope requirements apply. Preferably, the 'pie piece' running slope can be maintained at slope consistent with a ramp landing slope (1:64). (Figure 3.1.17)

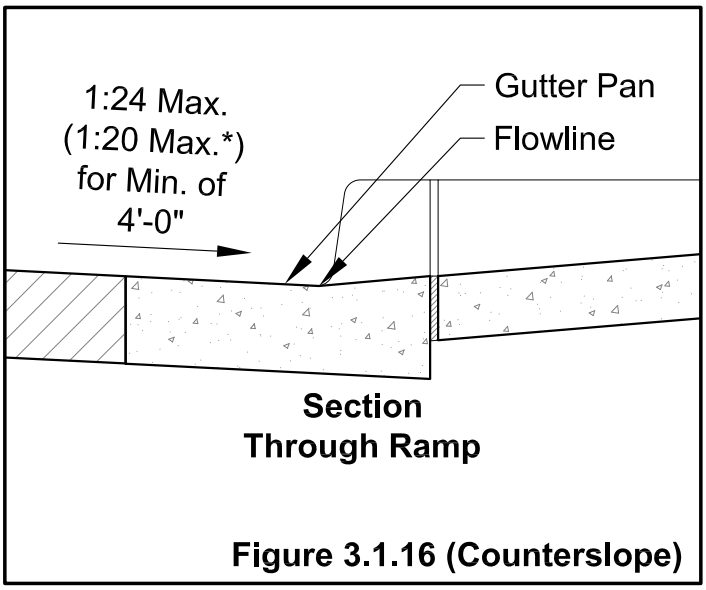


Figure 3.1.16 (Counterslope)

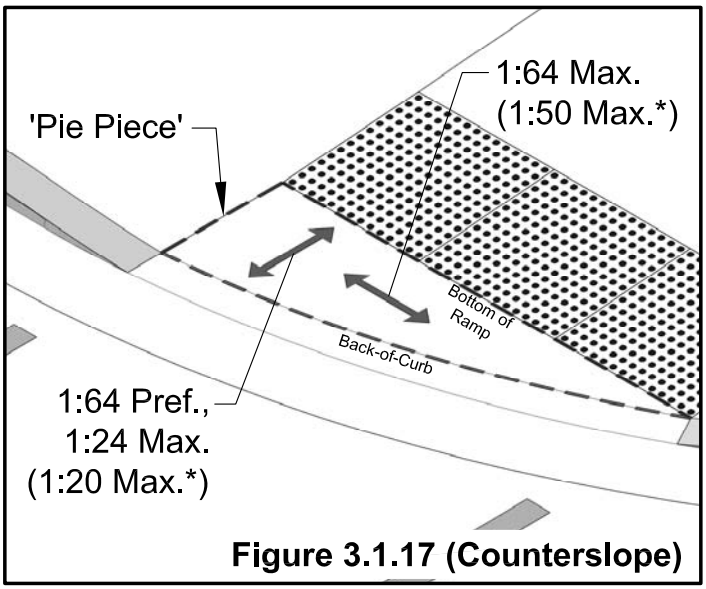


Figure 3.1.17 (Counterslope)

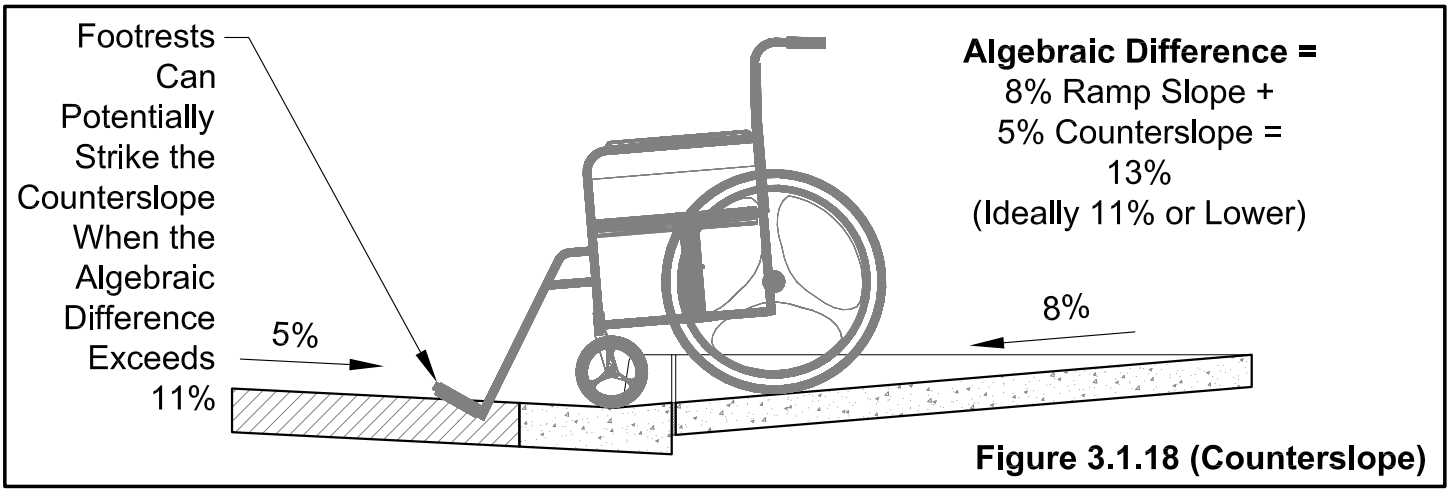


Figure 3.1.18 (Counterslope)

* This dimension or condition may be applied only in alterations to the existing as-built environment when the CDOT standard is not technically feasible or cannot be implemented without creating an unfavorable design solution.

Marked Crosswalks (Relationship to Curb Ramp)

Where curb ramps meet at marked pedestrian crosswalks, the base of the ramp must fall within the marked area of the crosswalk. A pedestrian with a wheeled device may be entering the street crossing with momentum gained from the ramp slope. As such it is necessary that the wheeled device is within the confines of the marked crosswalk. (Figure 3.1.19)

Some intersections may present pedestrian crossing challenges due to the existing geometry and configuration of the streets. At times it may be necessary to orient the curb ramp at an angle that does not directly align with the marked crosswalk. (Figure 3.1.20)

When the run of the curb ramp does not directly align with the marked crosswalk, a four foot by four foot minimum clear maneuvering area must be provided at the base of the curb ramp. This clear area must be fully contained within the area of the marked crosswalk. This clear maneuvering area at the base of the ramp is provided to ensure that a pedestrian utilizing a mobility assistive device has the space necessary to re-establish the orientation to make the street crossing and/or ramp ascension. This condition is not ideal because maneuvering for some pedestrians will be required in the street rather than on the sidewalk, **likely resulting in additional time needed to perform the street crossing.** (Figure 3.1.20)

Refer to Section 5.0 for additional crosswalk information.

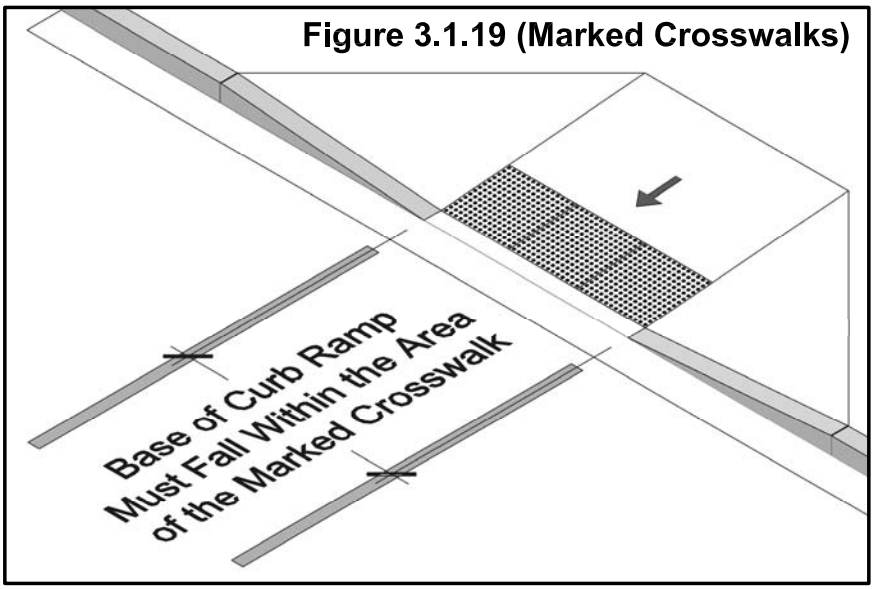


Figure 3.1.19 (Marked Crosswalks)

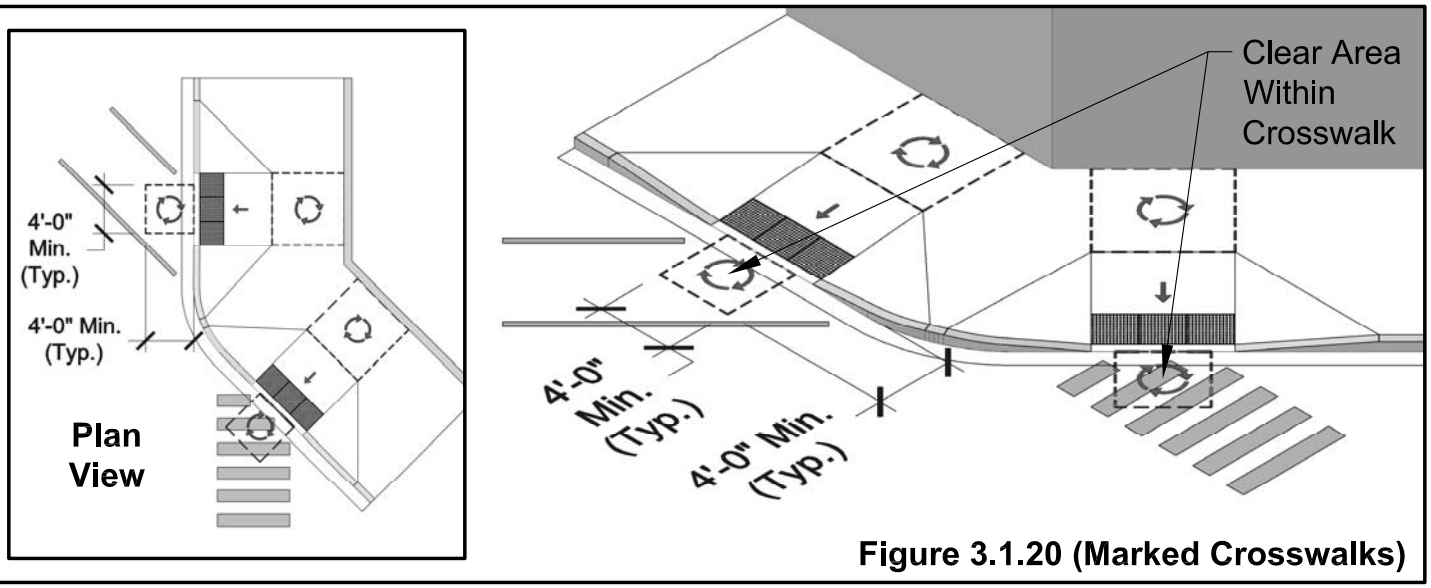


Figure 3.1.20 (Marked Crosswalks)

3.2 Curb Ramps - Types of Curb Ramps

3.2.1 Overview

Because every site is unique, a typical curb ramp design may not be able to be applied at every location. Varying sidewalk widths, available right-of-way, and existing utilities can affect selection of the best type of curb ramp to connect the sidewalk with a street crossing. It is important to weigh all options when choosing a particular curb ramp design for each location. Curb ramps with different shapes and/or orientations can help address site challenges. At times, it may be necessary to use combinations from various curb ramp designs to solve difficult problems.

There are three fundamental curb ramp designs to understand:
- Perpendicular Curb Ramps (Figures 3.2.1, 3.2.2)
- Parallel Curb Ramps (Figure 3.2.3)
- Combination Curb Ramps (Figure 3.2.4)

It is important that consistency be a part of accessible design. Curb ramps that are designed and built consistently make identification for pedestrians, notably the visually impaired, more simple and provide the best opportunity for a safe street crossing.

Figure 3.2.1 (Perpendicular Ramp)

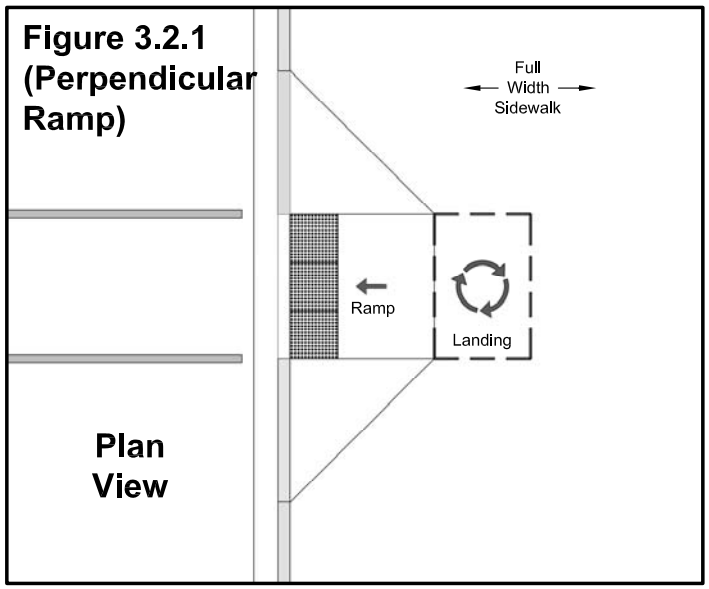


Figure 3.2.2 (Perpendicular Ramp)

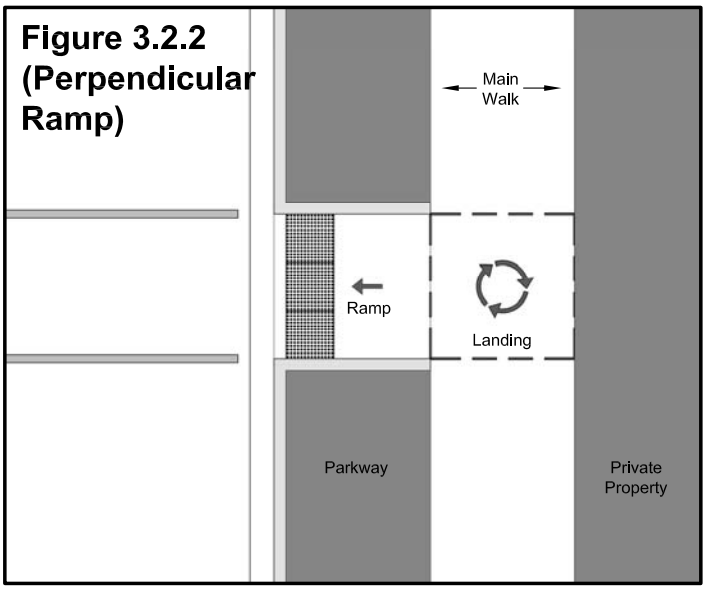


Figure 3.2.3 (Parallel Ramp)

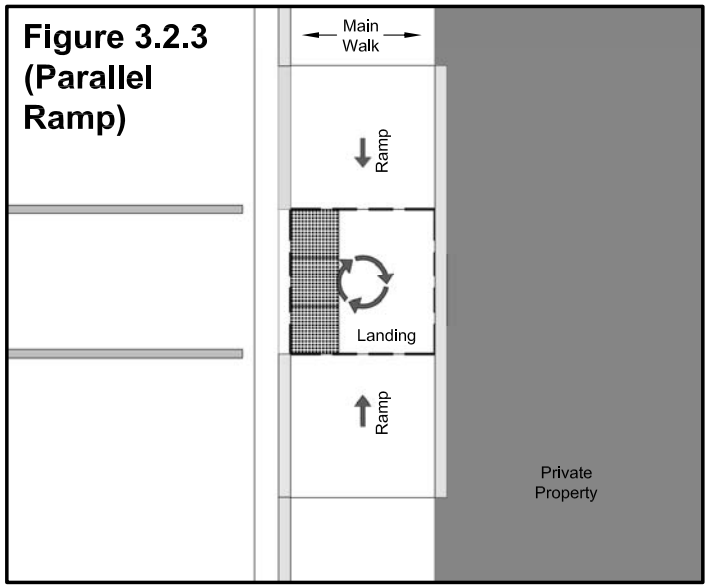
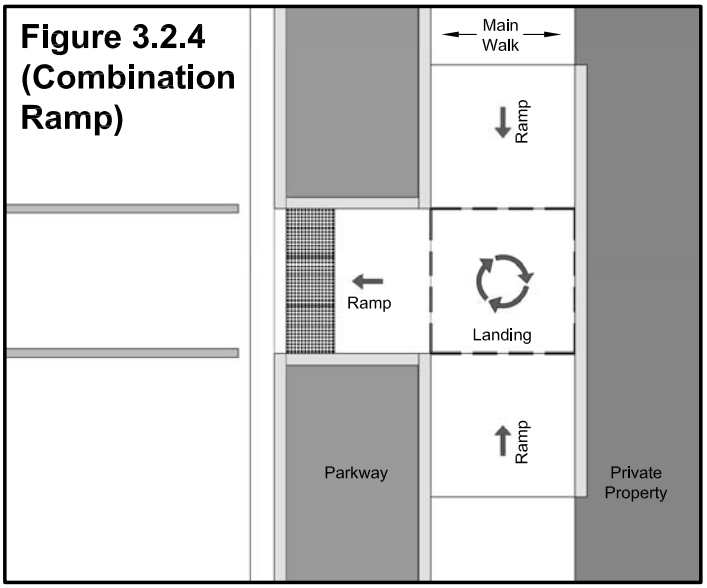


Figure 3.2.4 (Combination Ramp)



3.2.2 Perpendicular Curb Ramps

The perpendicular curb ramp the preferred design option. (Figure 3.2.5) This ramp is oriented perpendicular to the curb and the pedestrian usually descends this ramp into a street crossing directly in line with the run of the ramp.

The sides of the ramp are flared when the adjacent surfaces are concrete and identified as a pedestrian surface. This ramp requires a significant amount of sidewalk width particularly when a top landing is necessary for maneuvering. Side flares are not required where the surface adjacent to the ramp is not intended for pedestrian use. (Figure 3.2.6)

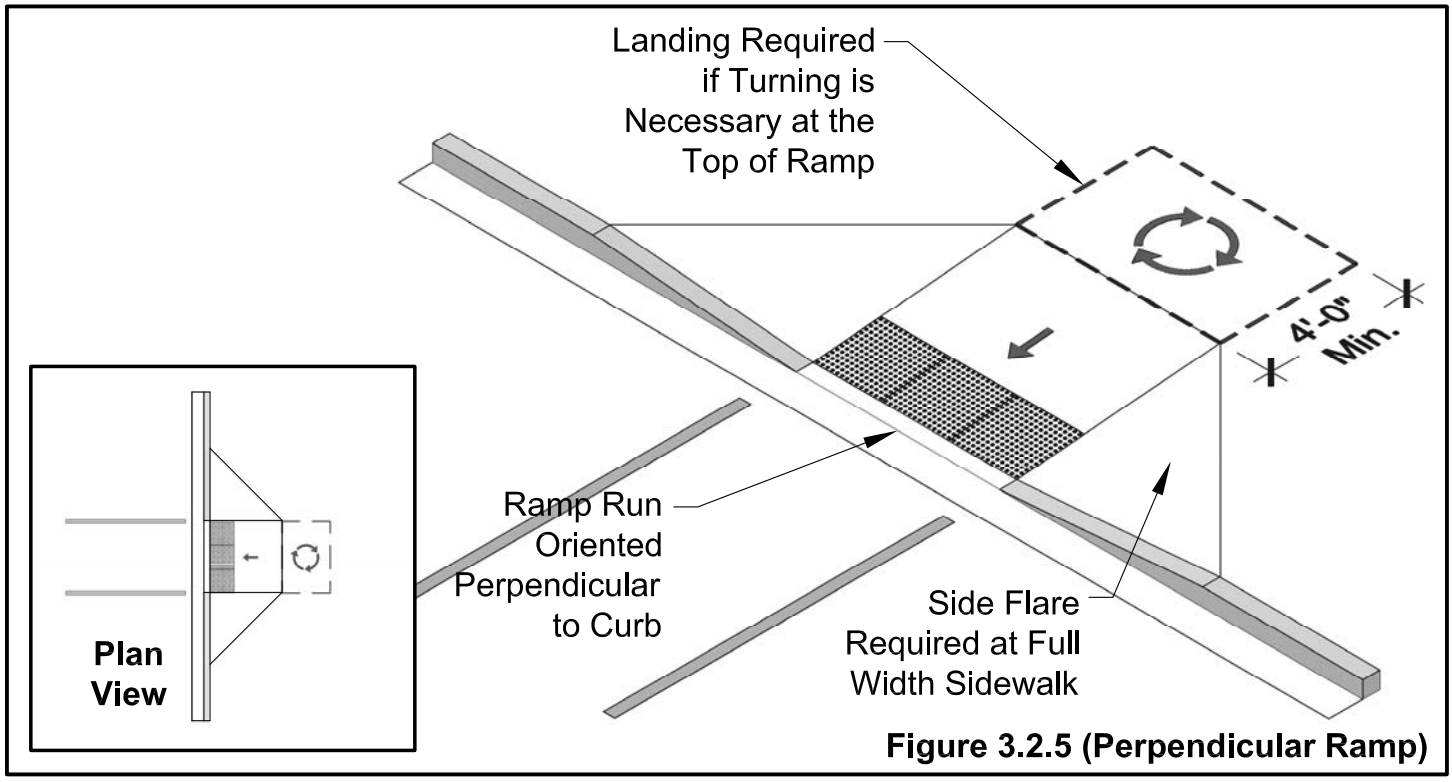


Figure 3.2.5 (Perpendicular Ramp)

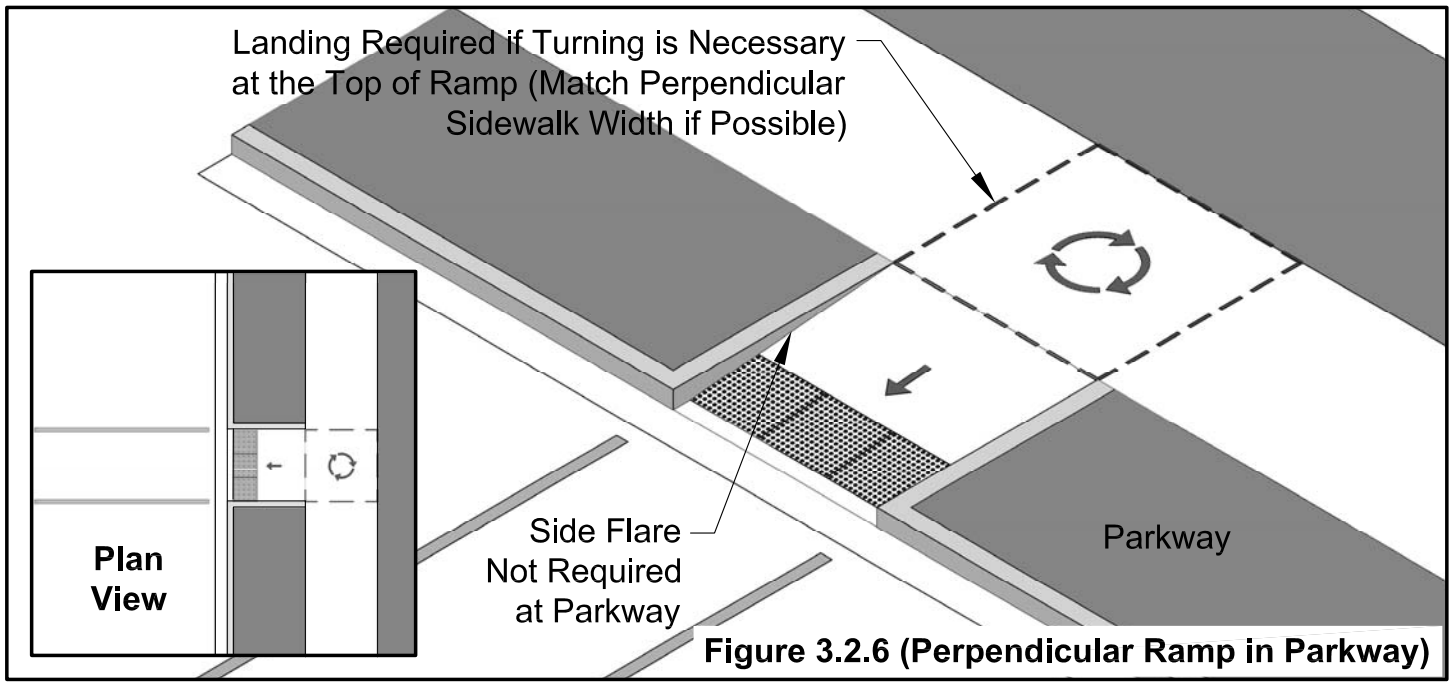


Figure 3.2.6 (Perpendicular Ramp in Parkway)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.2.3 Parallel Curb Ramps

Parallel curb ramps include two ramps that descend from opposite sides of the sidewalk down to a shared ramp landing area at the base. This type of ramp can be used when the width of the sidewalk is limited and the length of a perpendicular ramp and landing cannot be accommodated. (Figure 3.2.7)

Because the ramp landing area is flush with the elevation of the street, detectable warning surface must be provided at the back-of-curb for the full landing width. This landing width, measured parallel to the curb, is preferably 6 feet (4 feet minimum) to ensure that a wheelchair will not strike the opposing ramp upslope. The depth of the ramp should match the width of the sidewalk, and the warning surface may be included in this depth. Unless a turn is required at the top of a parallel ramp, a top ramp landing is not required. Side curbs can be used, but are not required, at parallel ramps for separation between existing landscaping and/or the face of building.

If the pedestrian way terminates at the end of the parallel ramp landing, it is acceptable to have a one-directional ramp. (Figure 3.2.8)

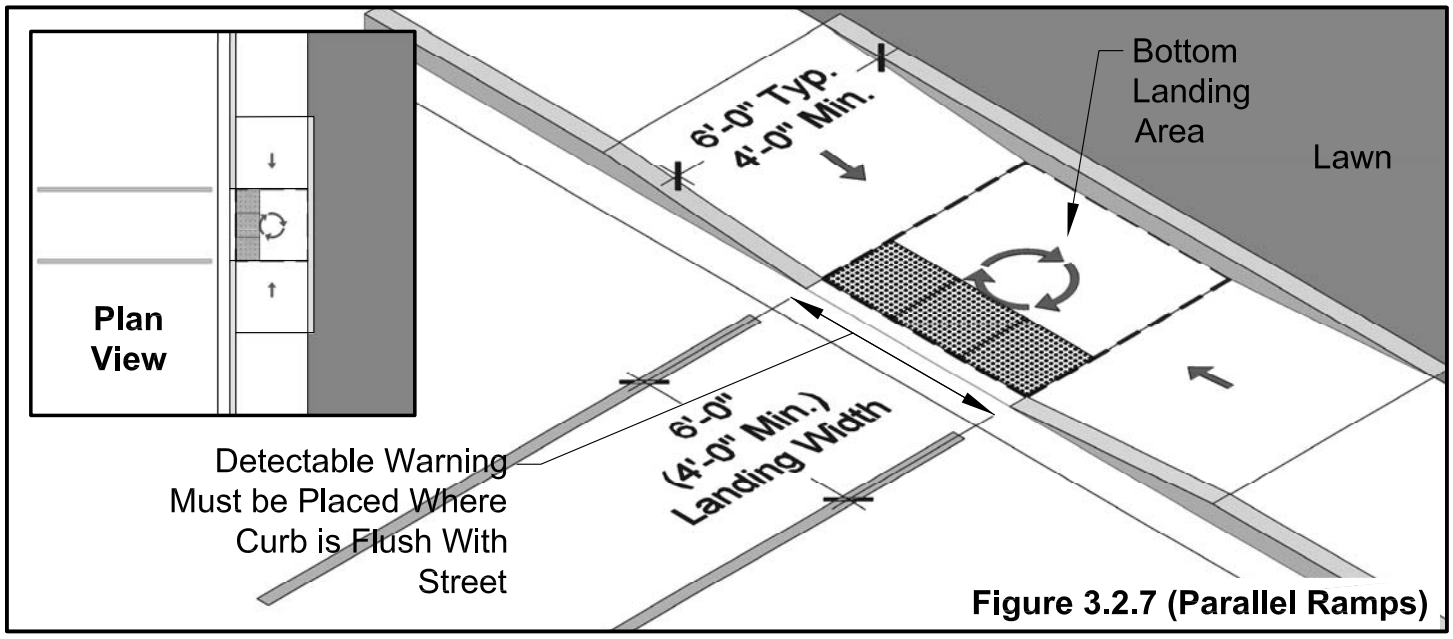


Figure 3.2.7 (Parallel Ramps)

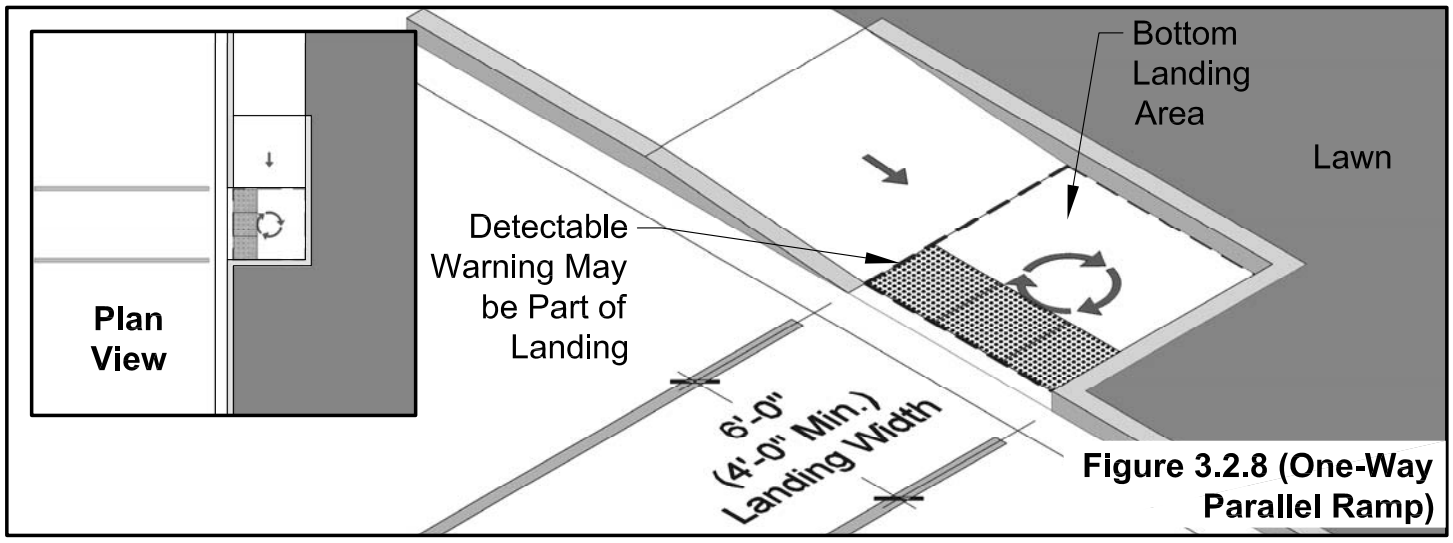


Figure 3.2.8 (One-Way Parallel Ramp)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.2.3 Parallel Curb Ramps (cont.)

In more dense urban areas, it may be possible to utilize parallel ramps, provided the minimal pedestrian access route can be maintained. Urban sidewalks may contain street furniture and other obstructions. If these obstructions cannot be relocated, the preferred ramp width of 6 feet may be reduced to 4 feet minimum (3 feet min.*). (Figure 3.2.9)

When a new ramp placed adjacent to an existing building, a back curb is usually installed to address the elevation differences between the new ramp and the existing building foundation. (Figure 3.2.9)

However, the reduction of access to existing facilities is not permitted. Therefore, a parallel ramp (ramp surface or landing) cannot be located at an existing door entry, creating a step. (Figure 3.2.10)

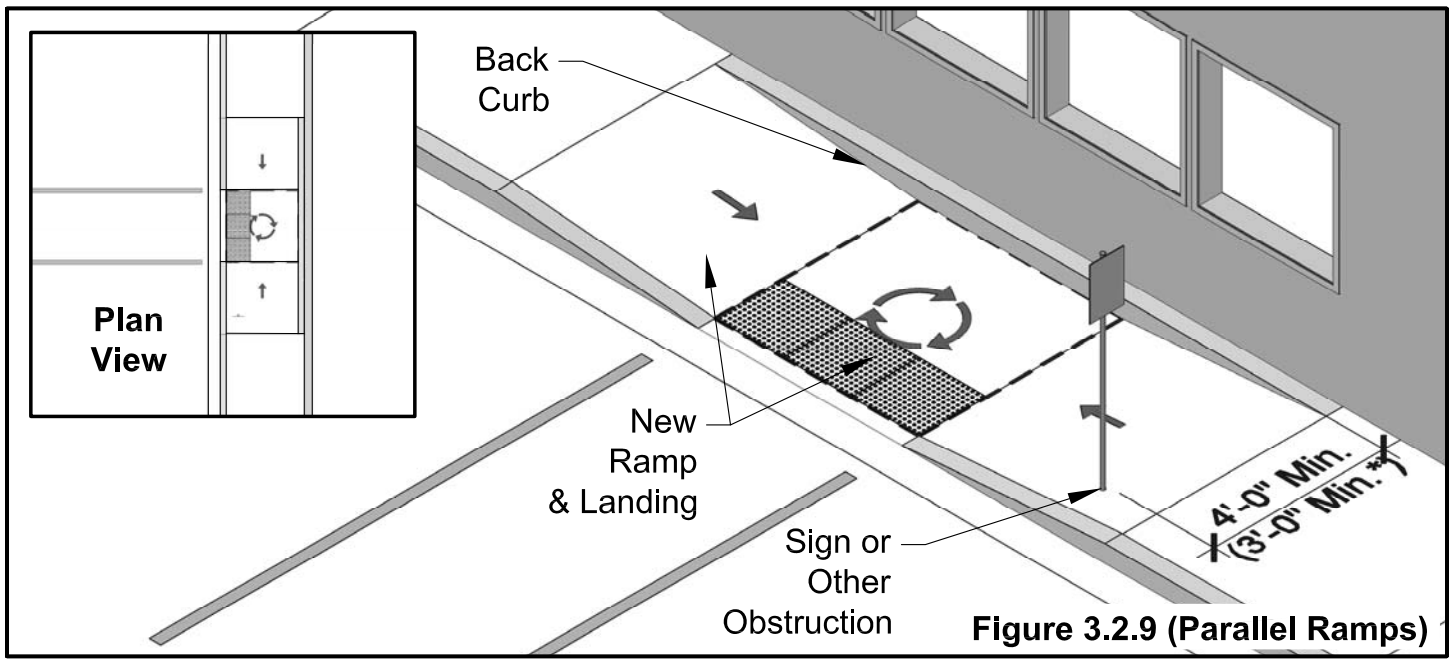


Figure 3.2.9 (Parallel Ramps)

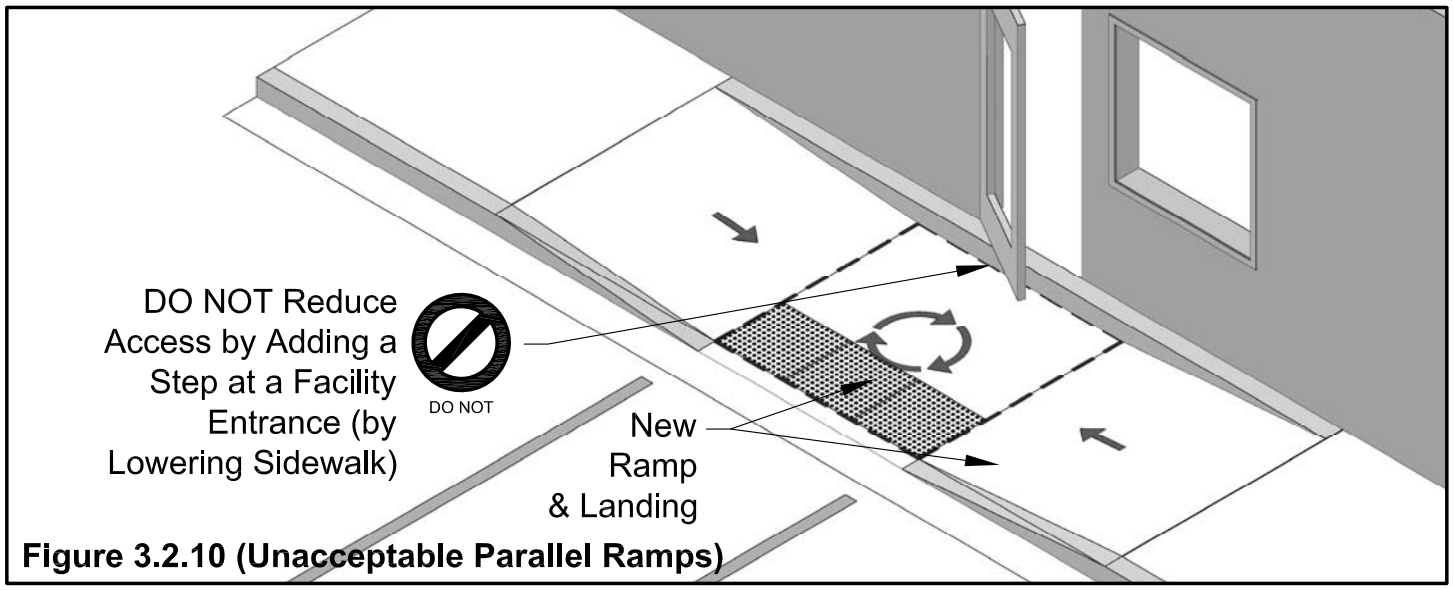


Figure 3.2.10 (Unacceptable Parallel Ramps)

Note: Refer to Section 3.1 for typical curb ramp requirements.

* This dimension or condition may be applied only in alterations to the as-existing built environment when the CDOT standard is not technically feasible or cannot be implemented without creating an unfavorable design solution.

3.2.3 Parallel Curb Ramps (cont.)

If necessary, parallel curb ramps may be installed on wide, full width concrete sidewalks so long as a tripping hazard or a cross slope problem is avoided. If a parallel ramp design is employed, it must either match the full width of the sidewalk or the edge must be protected to eliminate a tripping hazard. (Figure 3.2.11)

Creating a flared edge adjacent to a parallel ramp is not a suitable design alternative. The main line sidewalk should not be transitioned in a way that results in a steep cross slope. Typically, a ramp side flare is restricted to an area removed from the main pedestrian path, which is close to the property line or building face. The area adjacent to the curb is a suitable location for a side flare that will not disrupt the pedestrian flow. Additionally, **sloping the sidewalk in front of an existing facility entrance is considered a reduction of access and is not permitted**. (Figure 3.2.12)

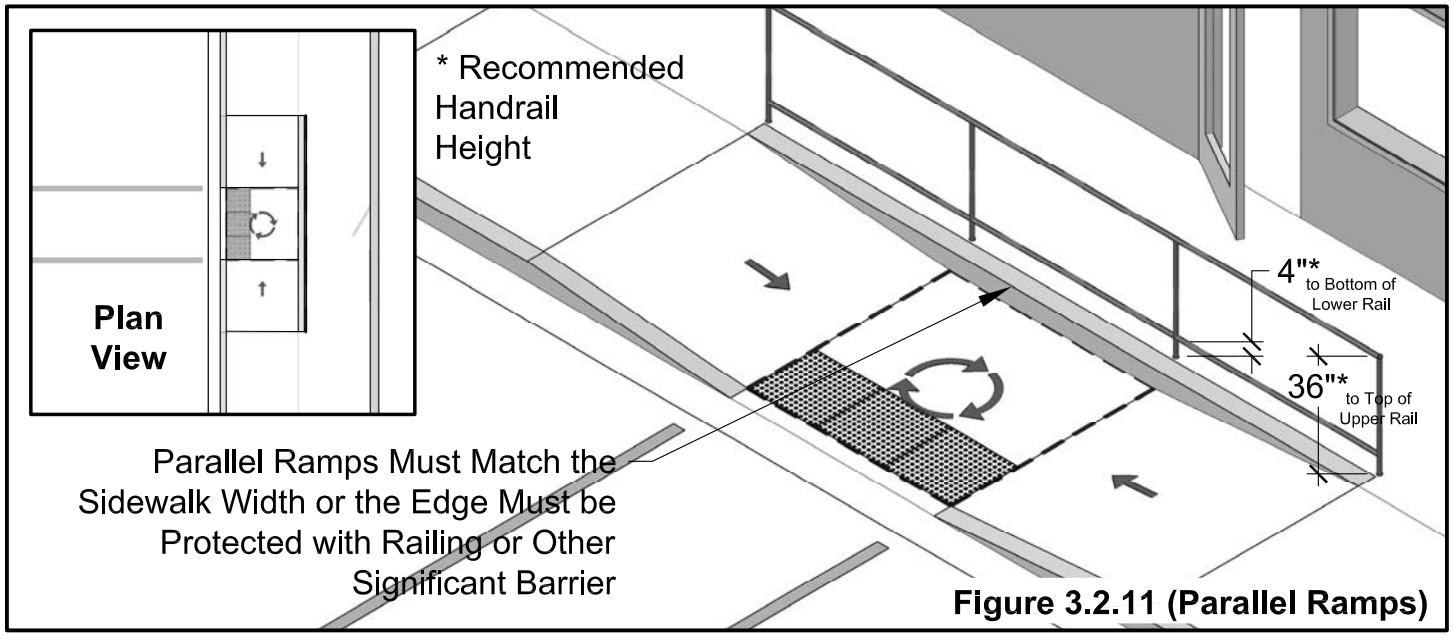


Figure 3.2.11 (Parallel Ramps)

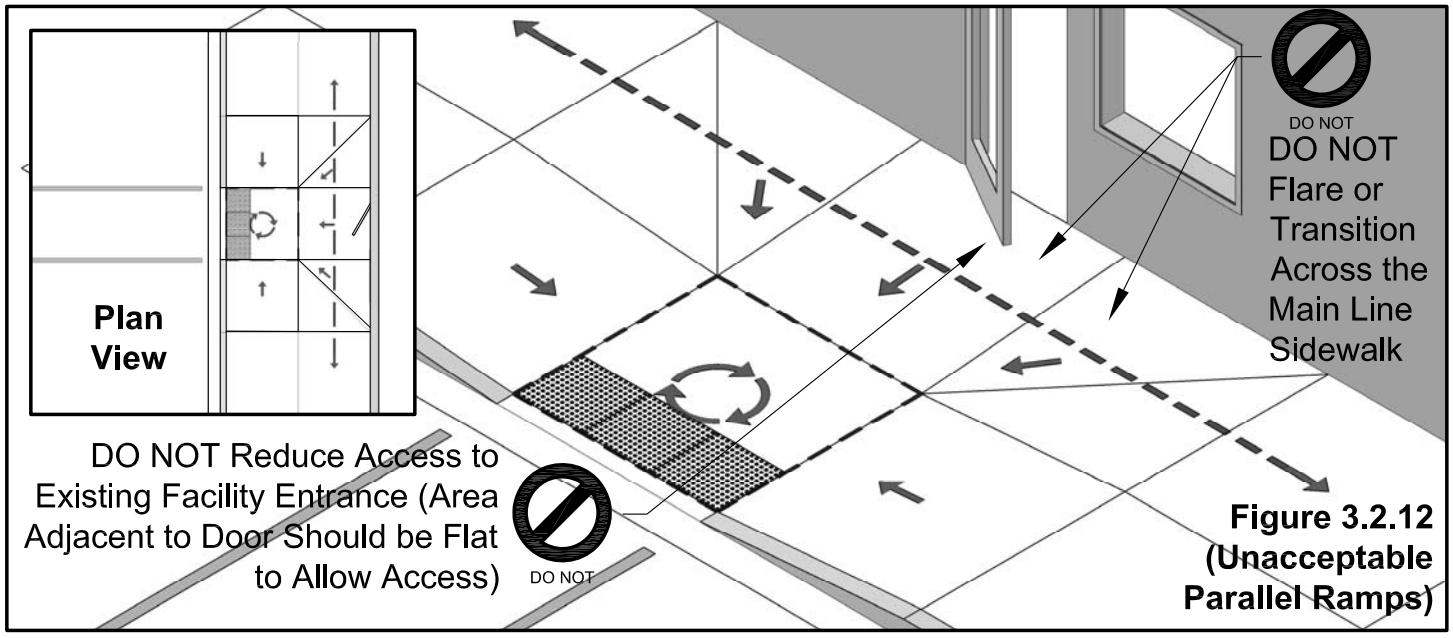


Figure 3.2.12 (Unacceptable Parallel Ramps)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.2.4 Combination Ramps

In the event that the elevation difference from the street level up to the sidewalk is more than the standard curb height, it may be necessary to combine the perpendicular ramp with parallel ramps. (Figure 3.2.13)

For a combination ramp utilized on a full width concrete sidewalk, ramp flaring can only take place away from the main pedestrian access route and elevation drop-offs or curbs are not permitted anywhere in the main line sidewalk.

The landing area between the ramps must match the ramp widths encountered from each direction. Ideally, the intermediate landing area should be at least 6 feet by 6 feet, clear of any obstructions. This landing allows for a pedestrian with disabilities to rest and/or change directions between ramp runs.

The detectable warning surface must not be placed leading from the top ramps into the intermediate landing, as the visually impaired may perceive the intermediate ramp landing as a potentially hazardous area for pedestrian travel. This incorrect cue could cause confusion. **The detectable warning surface is to be placed only where the ramp leads into the vehicular way.** (Figure 3.2.13)

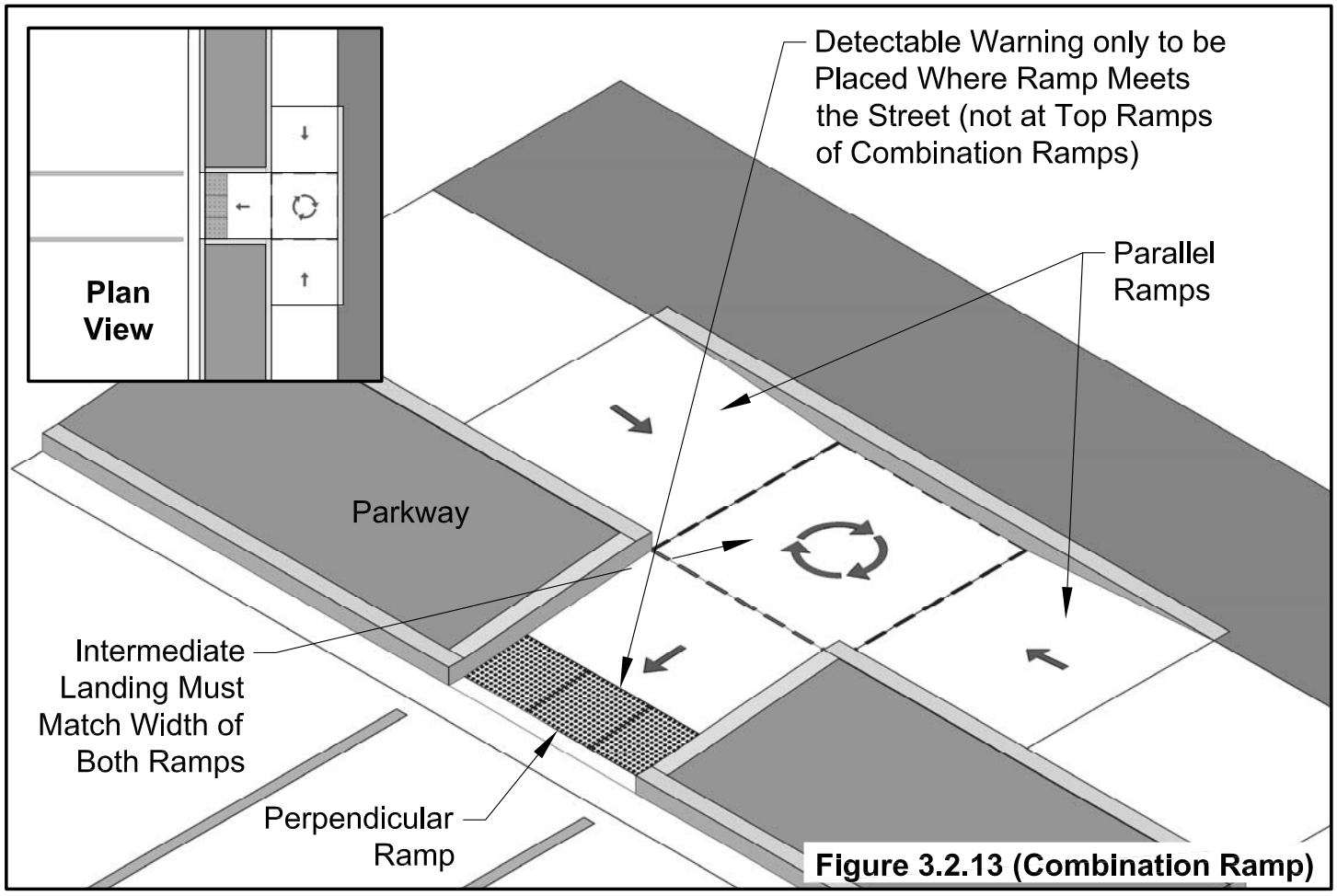


Figure 3.2.13 (Combination Ramp)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3 Curb Ramps - Ramps at Intersections

3.3.1 Overview

Curb ramps located at intersections may vary in shape, size, and orientation. Intersection geometry can affect the available options for appropriate curb ramp design as well as existing facility or business entries located near the corner.

There are four options for curb ramp designs at intersections:

- **Perpendicular Curb Ramps** (Figure 3.3.1)
- **Blended Transitions** (Figure 3.3.2)
- **Combination Curb Ramps** (Figure 3.3.3)
- **Diagonal Curb Ramps*** (Figure 3.3.4)

* Diagonal curb ramps should only be used when alterations to the existing as-built conditions are necessary and only when all other design options are exhausted.

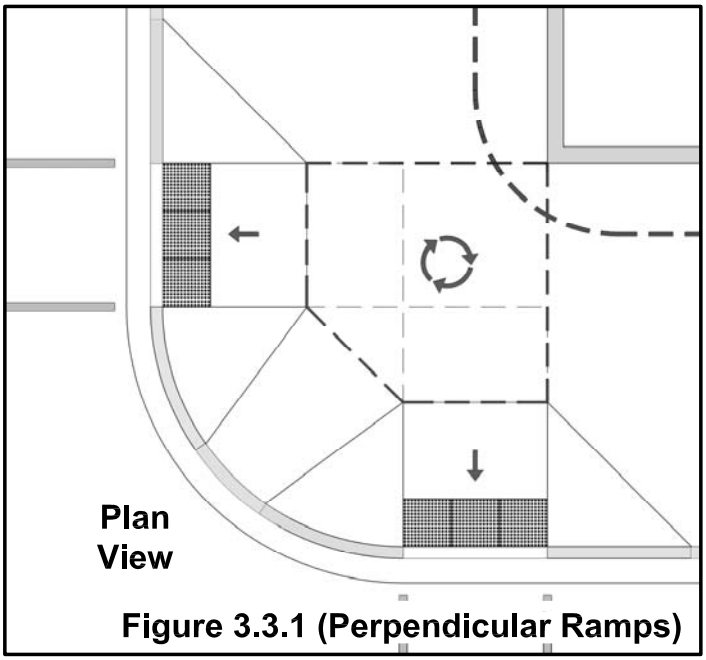


Figure 3.3.1 (Perpendicular Ramps)

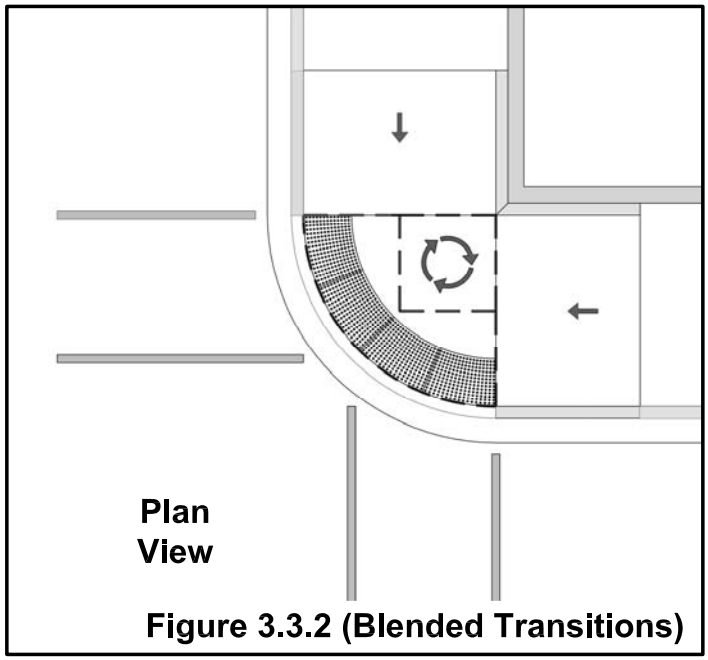


Figure 3.3.2 (Blended Transitions)

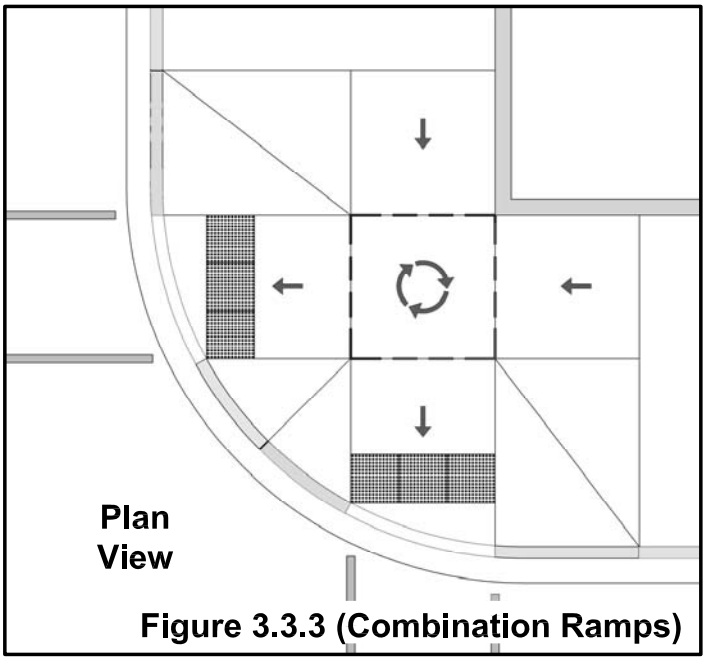


Figure 3.3.3 (Combination Ramps)

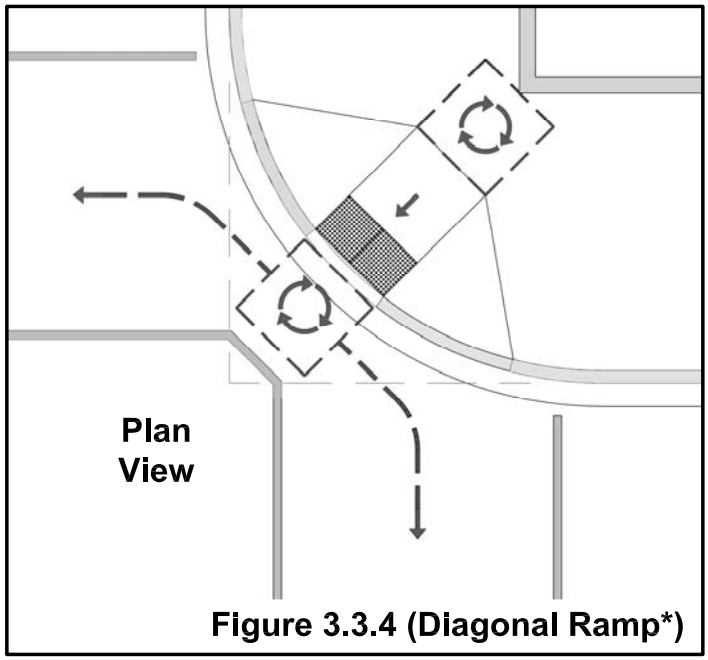


Figure 3.3.4 (Diagonal Ramp*)

3.3.1 Overview (cont.)

The following is a summary of the desirable (+) and less than desirable (-) characteristics of the various ramp design options.

1. Perpendicular Curb Ramps

(+/-) **The perpendicular curb ramp is the preferred design option that should be applied wherever possible.** Acceptable variances from the standards may be considered which will still satisfy federal minimum/maximum requirements while at the same time providing the preferred perpendicular curb ramp design. (Refer to Section 3.5.3 for acceptable variances)

(+) The perpendicular curb ramp design is arguably the most recognizable and understood configuration where consistency in design from one intersection to the next promotes efficient pedestrian circulation.

(+) The perpendicular curb ramp design typically aligns the pedestrian with the crosswalk.

(+) Standard perpendicular curb ramps do not usually require any maneuvering or turning within the vehicular way.

(-) *Perpendicular ramps typically require a significant width of sidewalk for the ramp run and the top ramp landing.*

2. Blended Transitions

(+) The blended transition is a good design option where there is not enough right-of-way to provide the top landing area required when installing a perpendicular curb ramp.

(+) Blended transitions allow for safe maneuvering/turning behind the back-of-curb and removed from the vehicular way.

(+) Parallel ramps allow for long ramp runs, if necessary.

(-) *The blended transition typically includes a significant amount of depressed curb at the corner which may result in water ponding if the drainage is not carefully considered.*

(-) *With the significant amount of depressed curb and the detectable warning surface oriented about the curb radius, the visually impaired may not be receiving as many cues regarding orientation of the street crossing.*

(-) *Pedestrians traveling around the corner, with no intent to enter into the street crossing, are forced to negotiate two ramps.*

3. Combination Curb Ramps

(+/-) Combination curb ramps should only be used when specifically needed due to a large elevation difference between street and sidewalk.

4. Diagonal Curb Ramps

(+/-) **Diagonal curb ramps should only be used when alterations to the existing as-built conditions are necessary and only when all other design options are exhausted.**

(+) Diagonal curb ramps may be a reasonable solution at corners with narrow sidewalks and existing barriers.

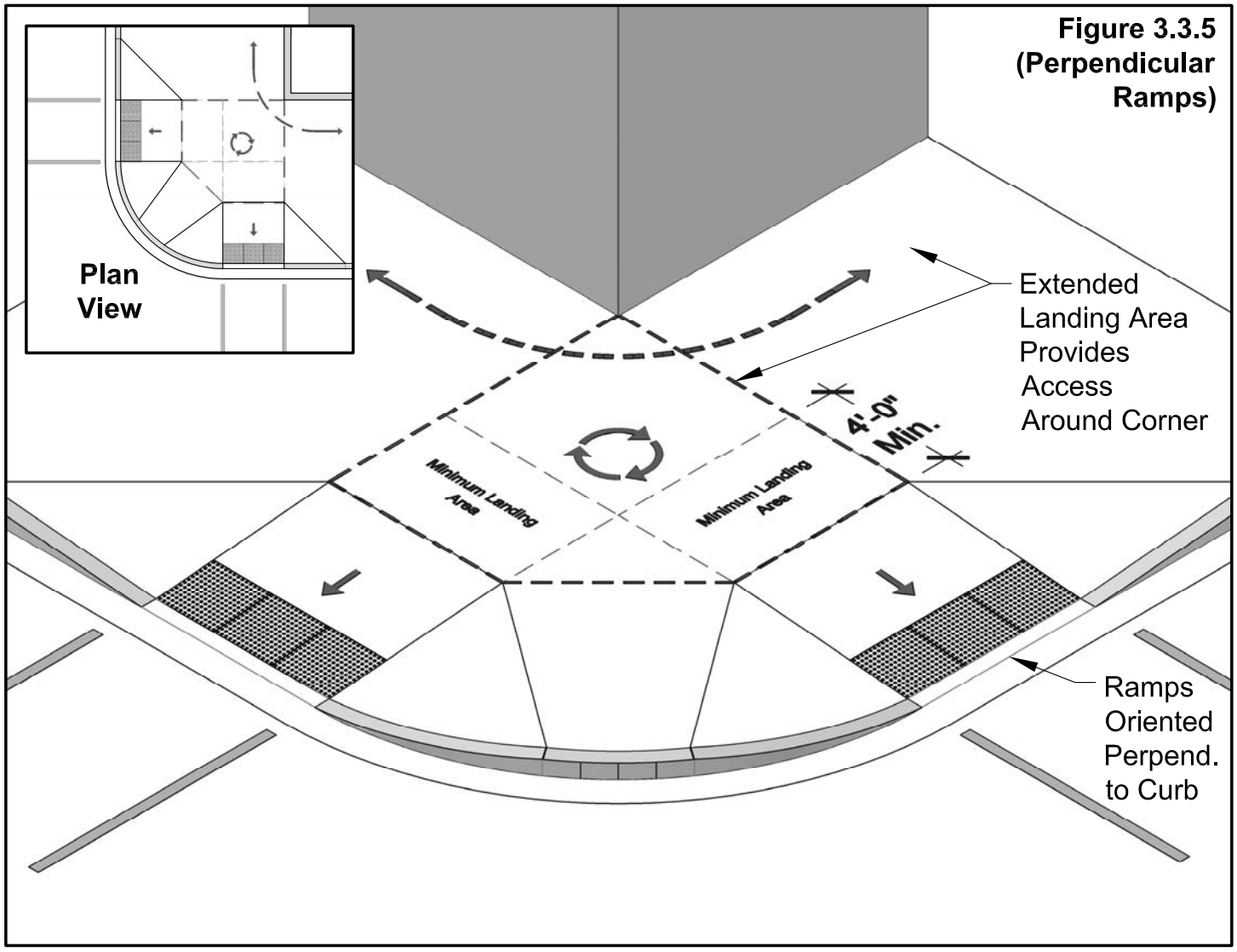
(-) *Pedestrians are forced diagonally into the vehicular way requiring maneuvering/turning in a potentially hazardous area.*

(-) *The visually impaired may find difficulties in establishing proper orientation with this ramp configuration because it is not aligned with either street crossing.*

3.3.2 Perpendicular Ramps

Wide sidewalks with no physical barriers allow for ramps to be placed conveniently in the desired locations. Ideally, the ramps should be located in alignment with the main line sidewalk at the building face or property line. However, ramps should not be placed too far from the corner as it is critical to maintain the desired site distance from vehicles that may be turning from the adjacent travel lane. The final design should be arrived at by balancing the needs of the pedestrian with those of vehicular traffic.

The required top ramp landing area dimension is equivalent to the width of the ramp by 4 foot minimum depth. However, it is good design practice to extend the landing area to include a larger area. (Figure 3.3.5) An extended landing area ensures accessibility for a pedestrian with mobility limitations an opportunity to maneuver at the top of each ramp as well as around the corner if the ramps are to be bypassed. Transitioning from the minimum curb ramp landing area to the existing property line with steep cross slopes may leave a sidewalk inaccessible or difficult to negotiate for some pedestrians. Expanding the scope of work slightly results in a more desirable situation.



Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.2 Perpendicular Ramps (cont.)

If the difference in elevation from street level up to the sidewalk exceeds the standard 6 inch curb height, transitioning the main line sidewalk from the ramp landing is not acceptable. (Figure 3.3.6)

The preferred design technique in this situation would be to use the property line or corner of the existing building as the control point. The ramp run can then be lengthened to attain the necessary elevation. (Figure 3.3.7)

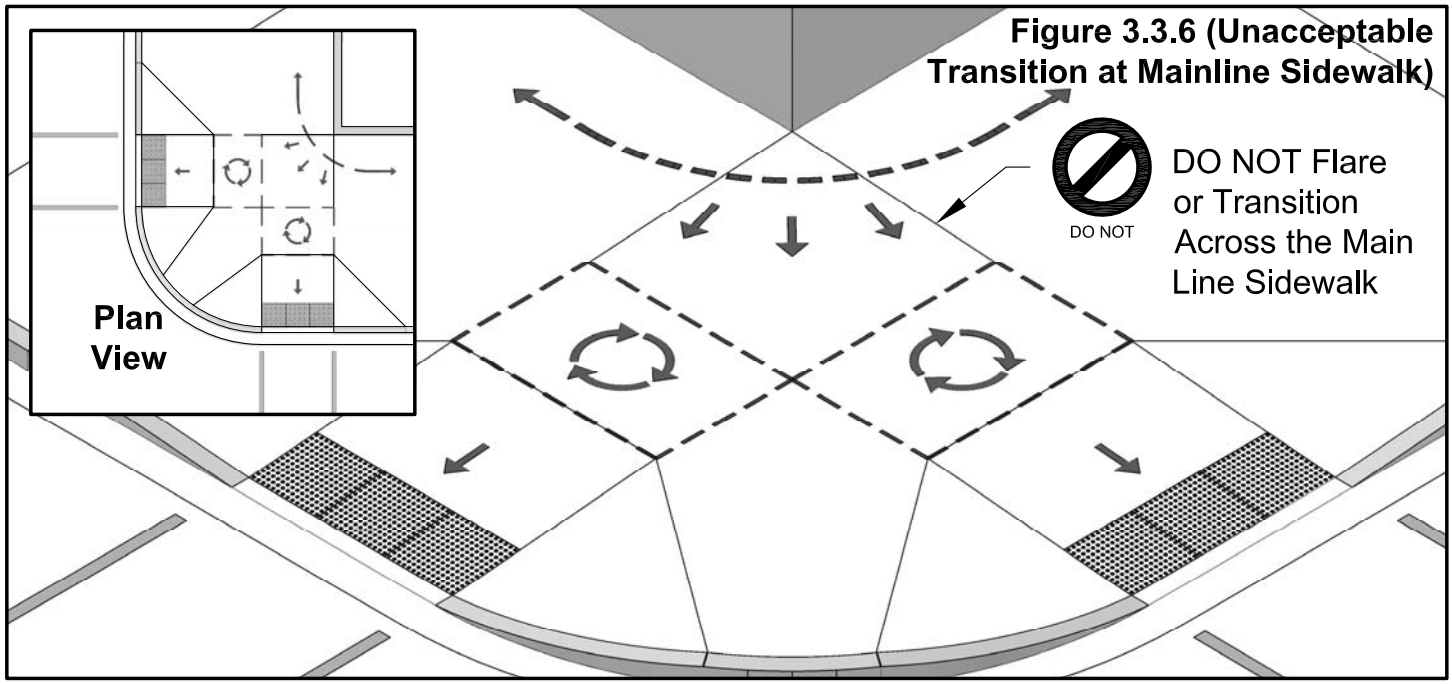


Figure 3.3.6 (Unacceptable Transition at Mainline Sidewalk)

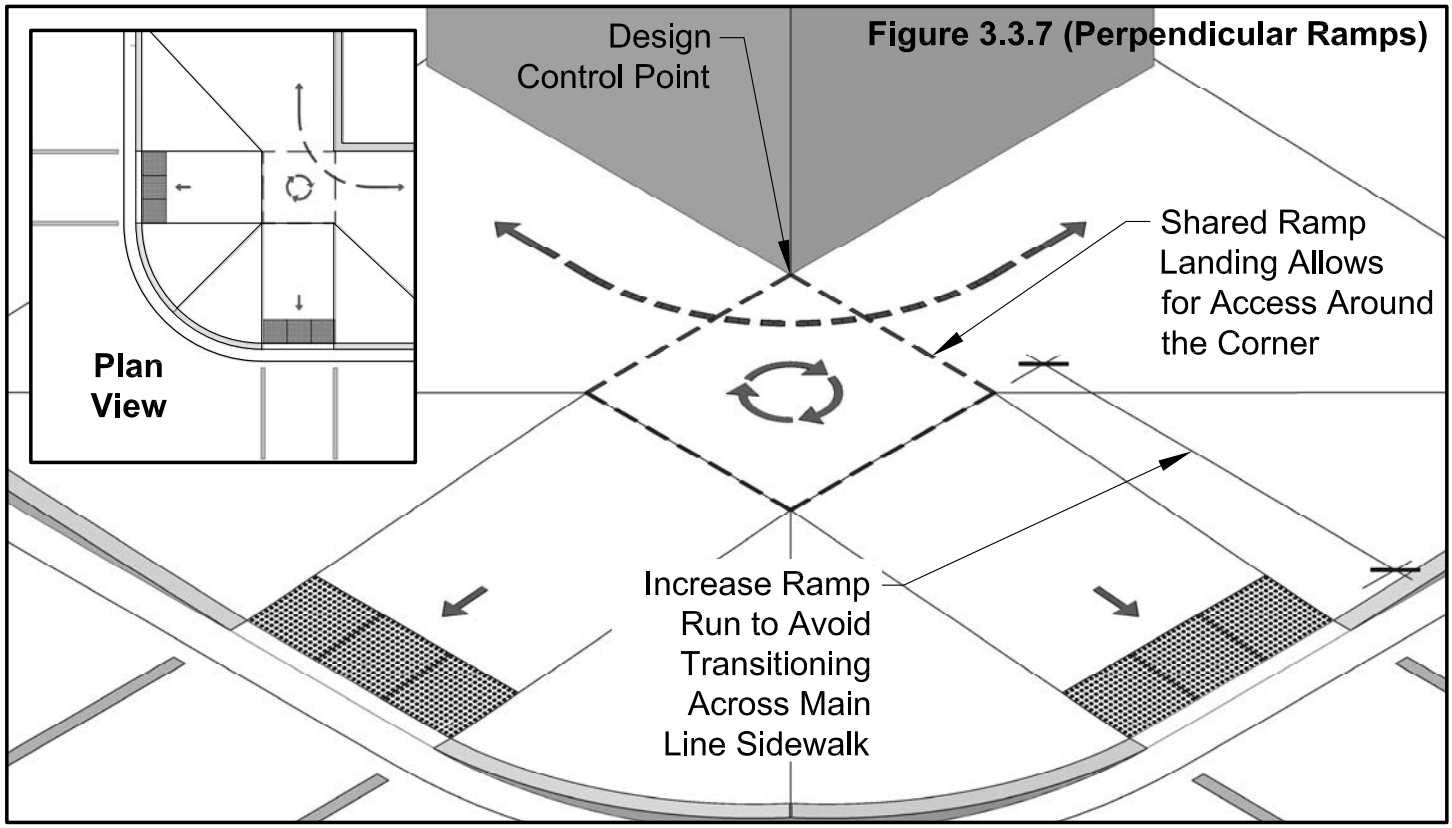


Figure 3.3.7 (Perpendicular Ramps)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.2 Perpendicular Ramps (cont.)

At intersections with diagonal streets or other complex geometry, it may be necessary to make some modifications to the standard perpendicular curb ramp design.

If sidewalks intersect at an acute angle, one option may be to run the ramps at an angle other than truly perpendicular to the curb. This will allow for the ideal condition that the curb ramp and the crosswalk are in alignment. The most efficient design will provide an extended and shared ramp landing area providing access to the curb ramps as well as for allowing pedestrians to travel around the corner. (Figure 3.3.11)

In some cases it may be difficult or impractical to align the ramp directly with the crosswalk. (Figure 3.3.12, next page) The available right-of-way and the location of the crosswalks may require the curb ramps to be oriented perpendicular to the curb, but at an angle to the crosswalk. (Figures 3.3.13, next page) Where the curb ramps and crosswalks do not align, a 4 foot by 4 foot minimum clear maneuvering area must be provided within the crosswalk striping (refer to Section 3.1 for additional information).

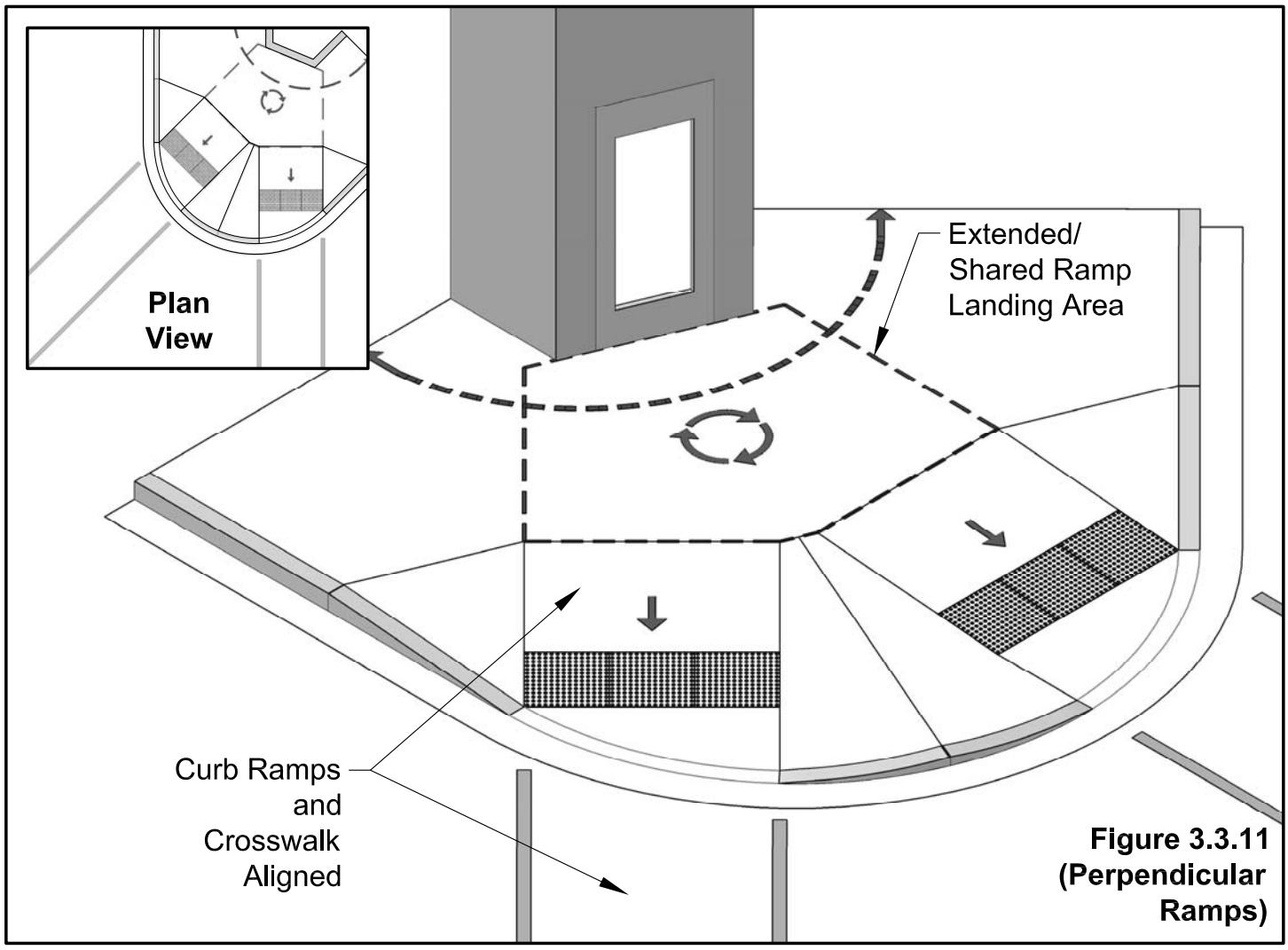


Figure 3.3.11 (Perpendicular Ramps)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.2 Perpendicular Ramps (cont.)

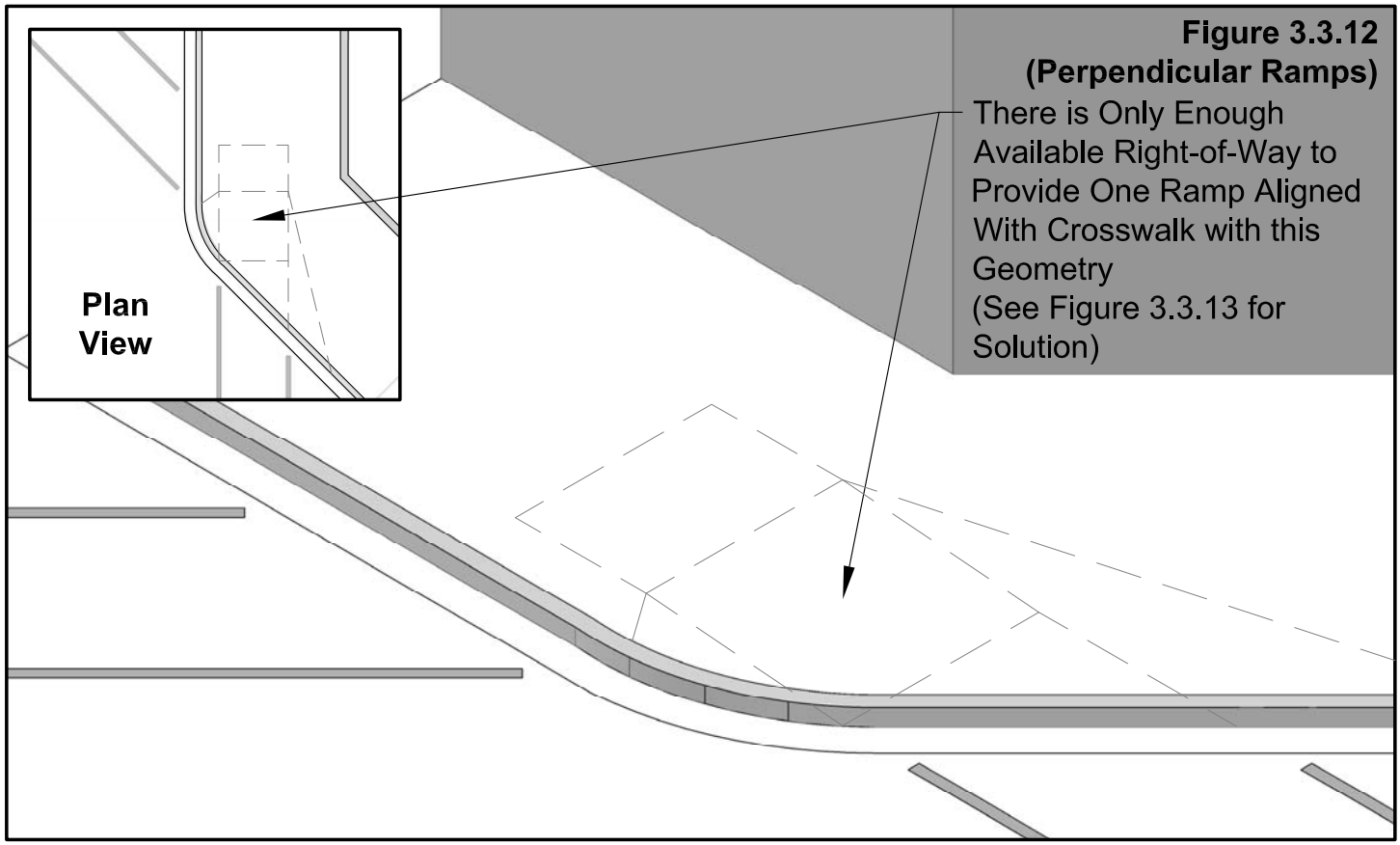


Figure 3.3.12 (Perpendicular Ramps)

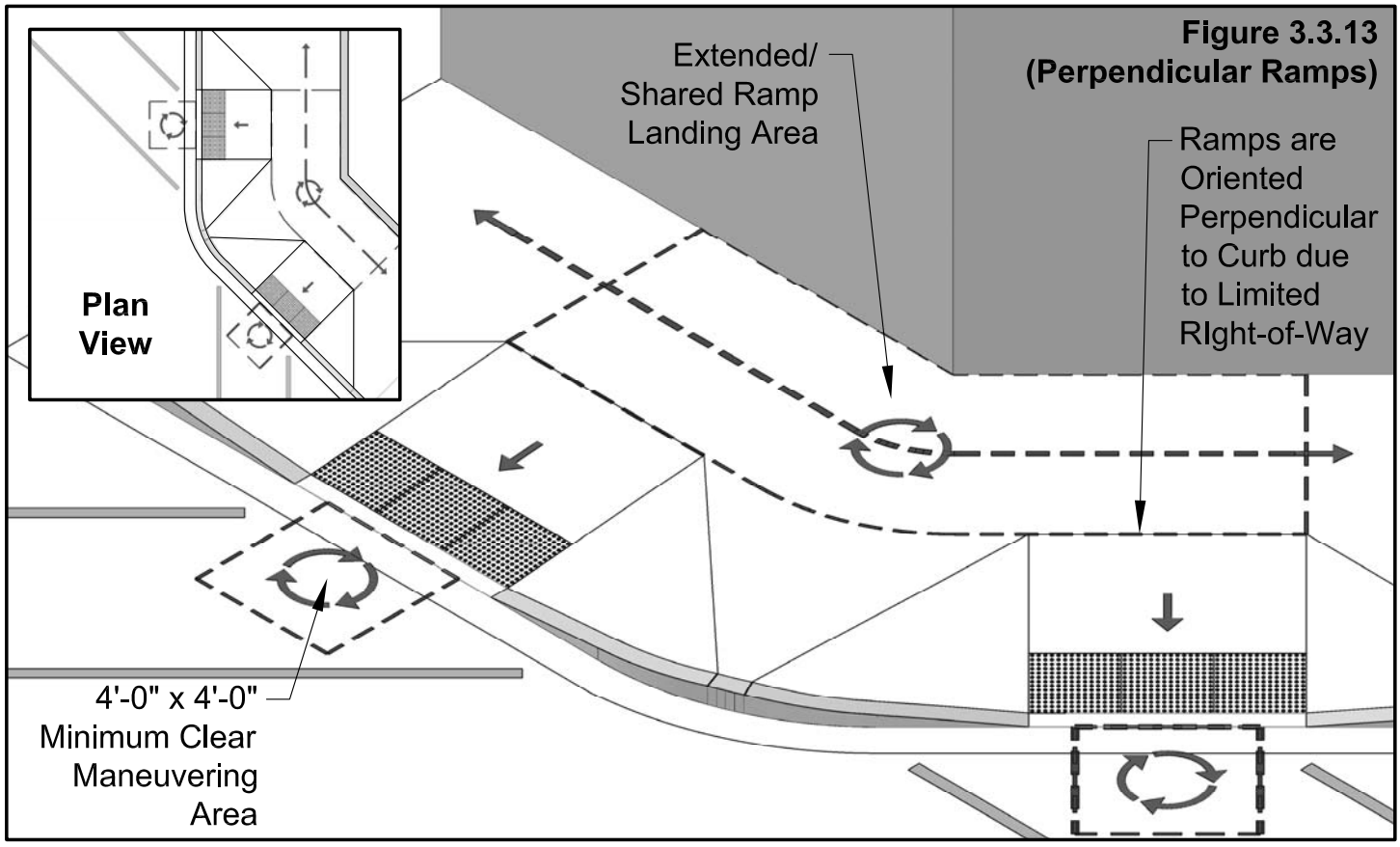


Figure 3.3.13 (Perpendicular Ramps)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.3 Blended Transitions

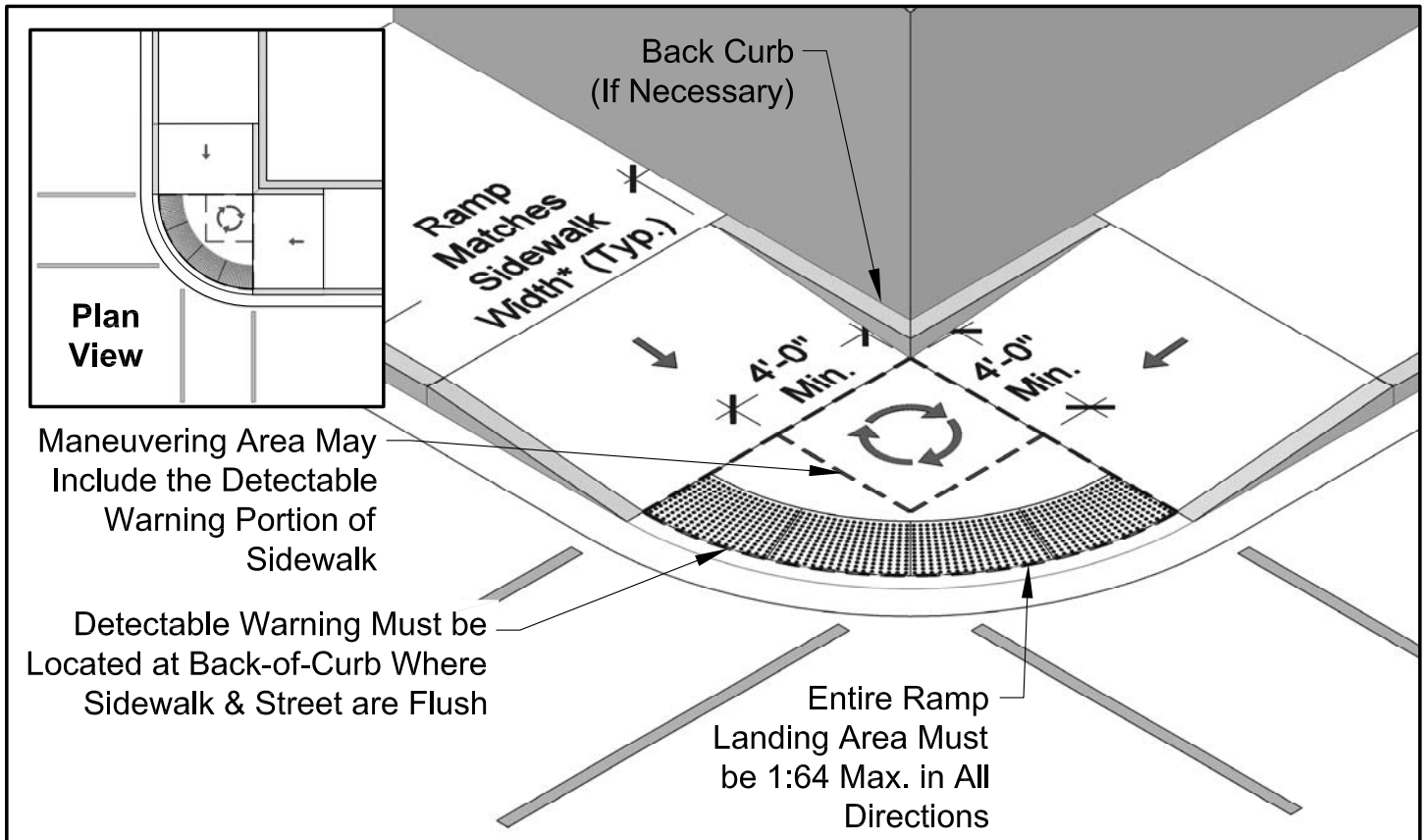
A blended transition design incorporates a set of parallel curb ramps positioned at the corner and a ramp landing area safely located in the sidewalk behind the back-of-curb. (Figure 3.3.14)

When the preferred two perpendicular ramp design is not feasible, the blended transition is an alternative to use in cases where the existing sidewalks are very narrow. This type of ramp may also be applied where the elevation difference from the street to the sidewalk is higher than a 6 inch curb height, as the run of the ramp can be easily increased in either direction of the main line sidewalk.

The ramp width of a blended transition design should match the width of the existing sidewalk, eliminating any transitioning or flaring across the main line sidewalk. **At a minimum, the ramp landing provided must include a 4 foot by 4 foot maneuvering area.**

Functional limitations with blended transition curb ramps which include corner drainage issues, inconsistent travel information and cues for the visually impaired, and the need for pedestrians to negotiate two ramps when traveling around a corner preclude their use as a preferred option. Blended transitions should be used only when the preferable design options have been exhausted.

Refer to Section 4.0 for additional information regarding detectable warning surface placement.



* It is acceptible for the ramp width to be slightly reduced (6" +/-) from the width of the sidewalk when a back curb is installed.

Figure 3.3.14 (Blended Transitions)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.3 Blended Transitions (cont.)

A blended transition is **not** typically an acceptable design at a corner with an existing facility entrance. Ramping the sidewalk down may create a step adjacent to the entry, and **the reduction of access to existing facilities is not permitted.** (Figure 3.3.15)

Although it appears that a pedestrian access route is provided (Figure 3.3.16), transitioning or flaring across the main line sidewalk is **not** an acceptable solution. A standard two perpendicular ramp design should be applied at wide sidewalks with sufficient right-of-way rather than creating non-compliant cross slopes.

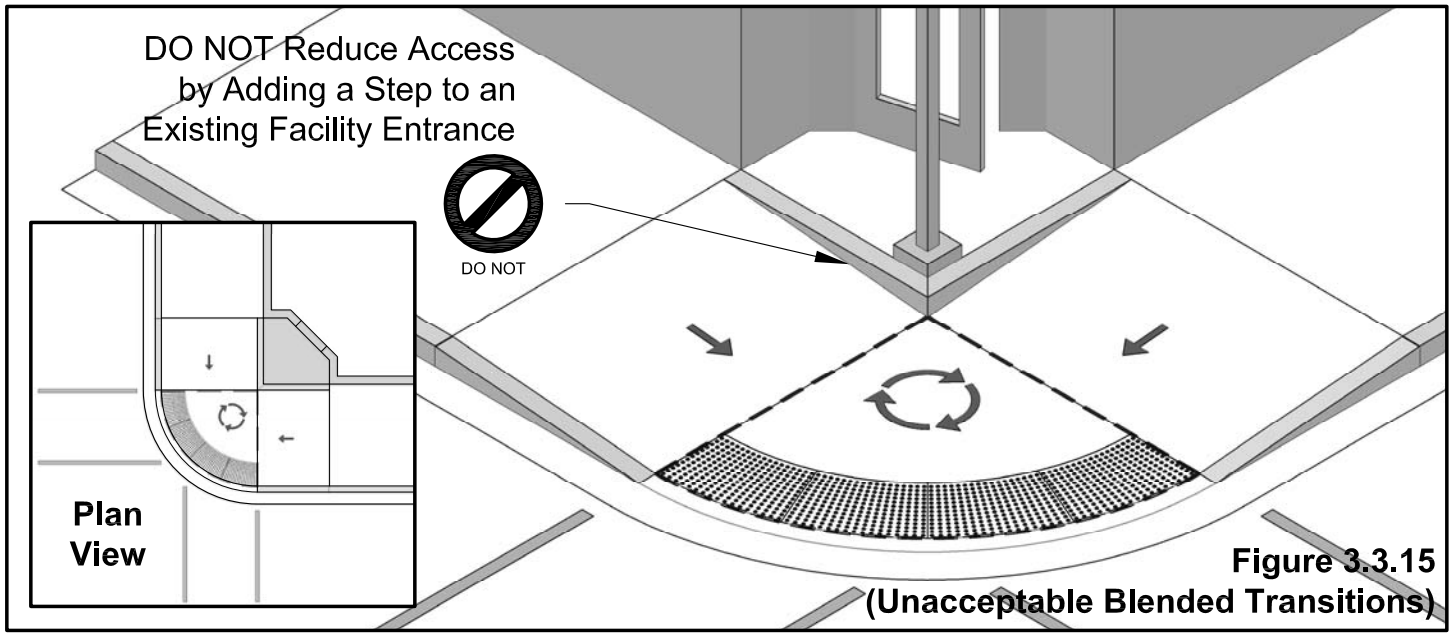


Figure 3.3.15
(Unacceptable Blended Transitions)

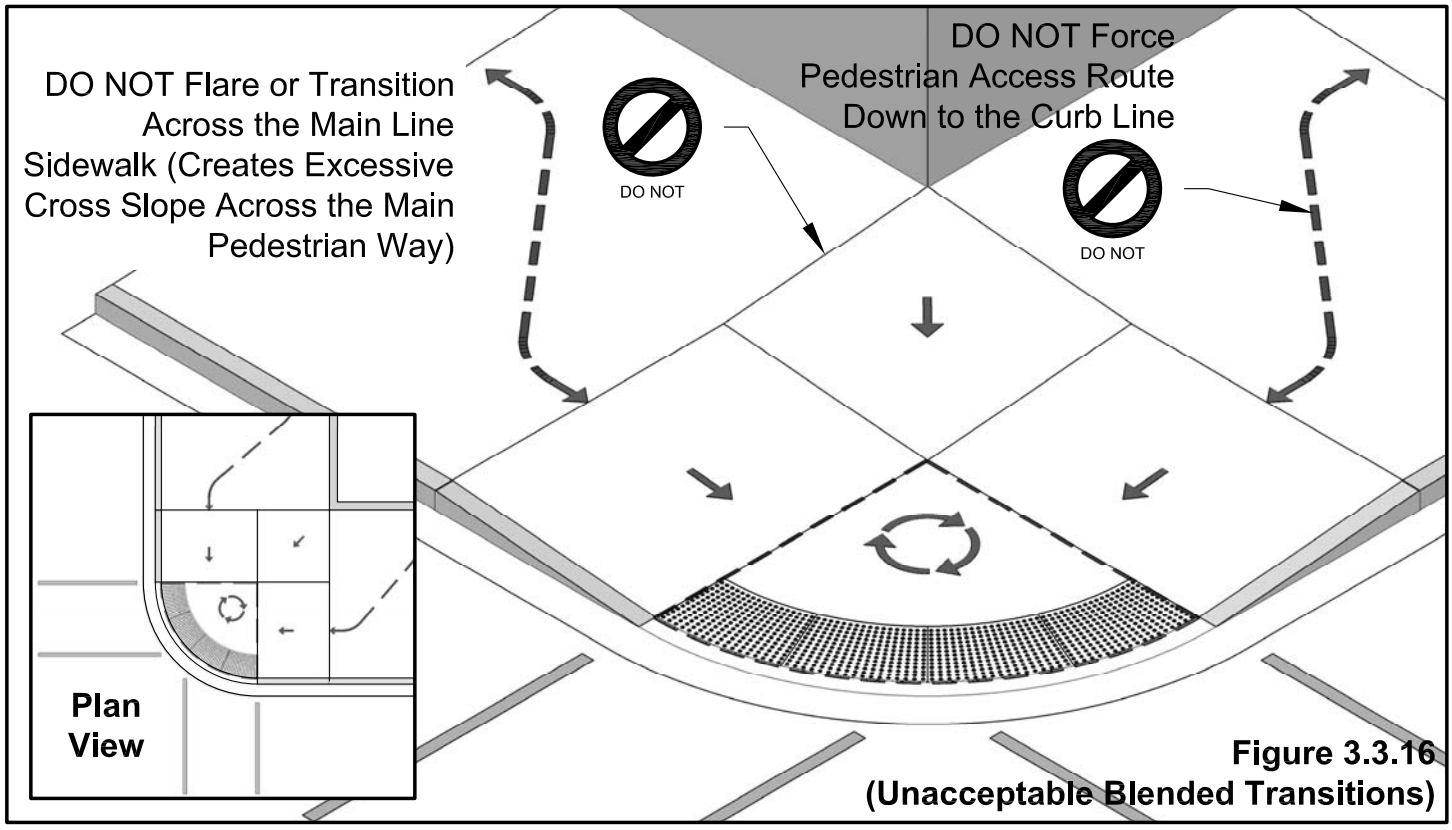


Figure 3.3.16
(Unacceptable Blended Transitions)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.3 Blended Transitions (cont.)

In areas that may have very narrow parkways or other conditions that do not supply enough right-of-way it may be necessary to depress the entire corner, providing detectable warning where the street and sidewalk are flush. (Figure 3.3.17)

This may also be necessary in situations where sidewalks of differing widths converge. (Figure 3.3.18)

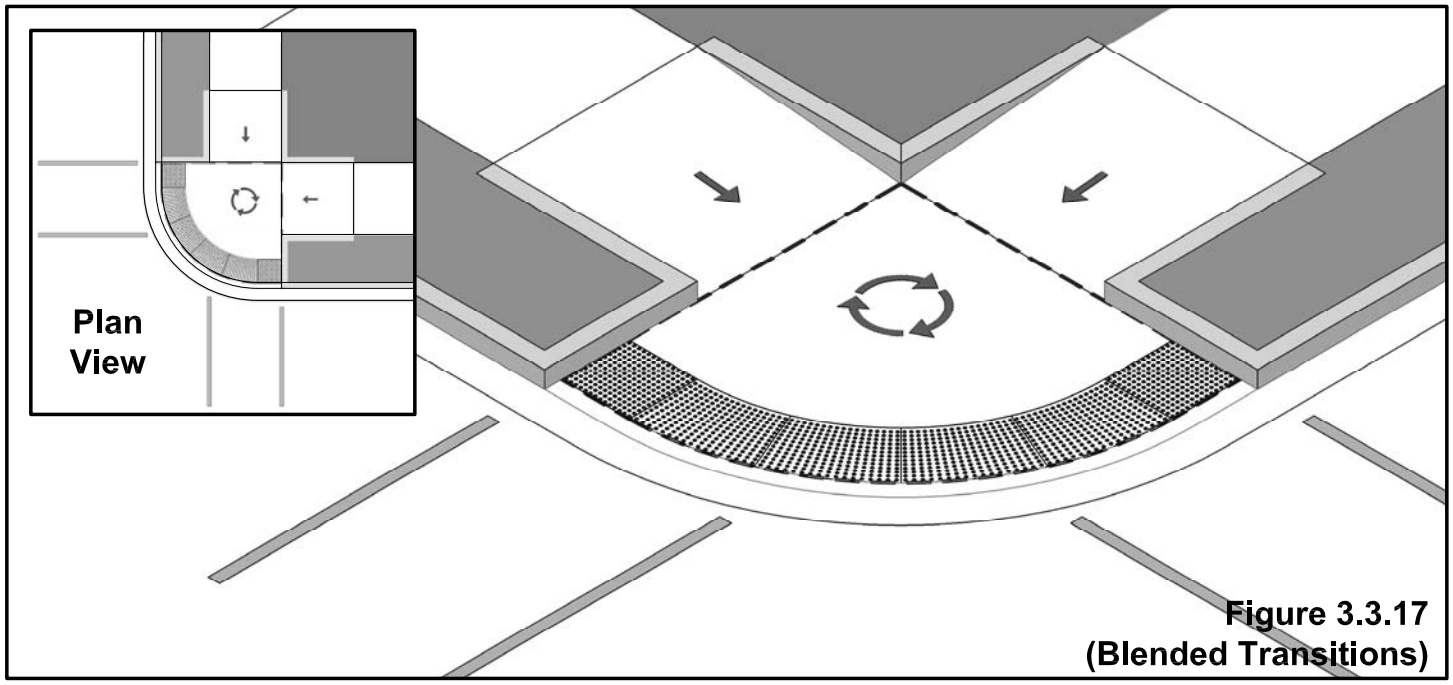


Figure 3.3.17
(Blended Transitions)

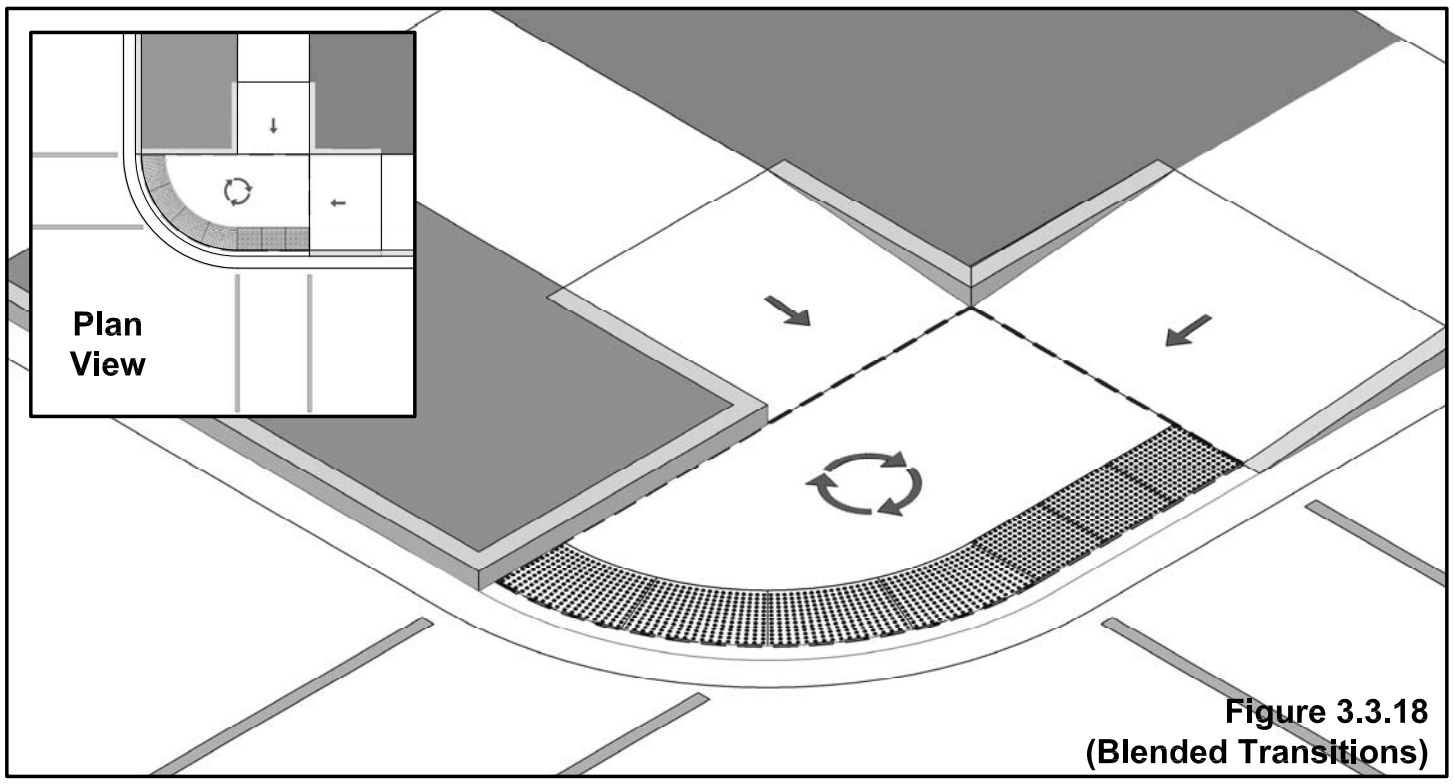


Figure 3.3.18
(Blended Transitions)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.3 Blended Transitions (cont.)

At intersections with diagonal streets, small curb radii, or other complex geometry issues, providing a ramp landing or maneuvering area behind the curb line is a much safer option than forcing a pedestrian user down into the vehicular lane to turn and proceed to the desired crosswalk.

The geometry of these landing areas are likely to be non-standard, involving unusual angles and/or curb radii. This 4 foot by 4 foot minimum maneuvering area must fit within the landing area (detectable warning surface may be included in this area) measured from the back-of-curb. This area guarantees that a wheelchair user will have room to turn within the landing area. It should be verified that a 4 foot by 4 foot maneuvering area be provided for each ramp within the overall ramp landing area. (Figure 3.3.19)

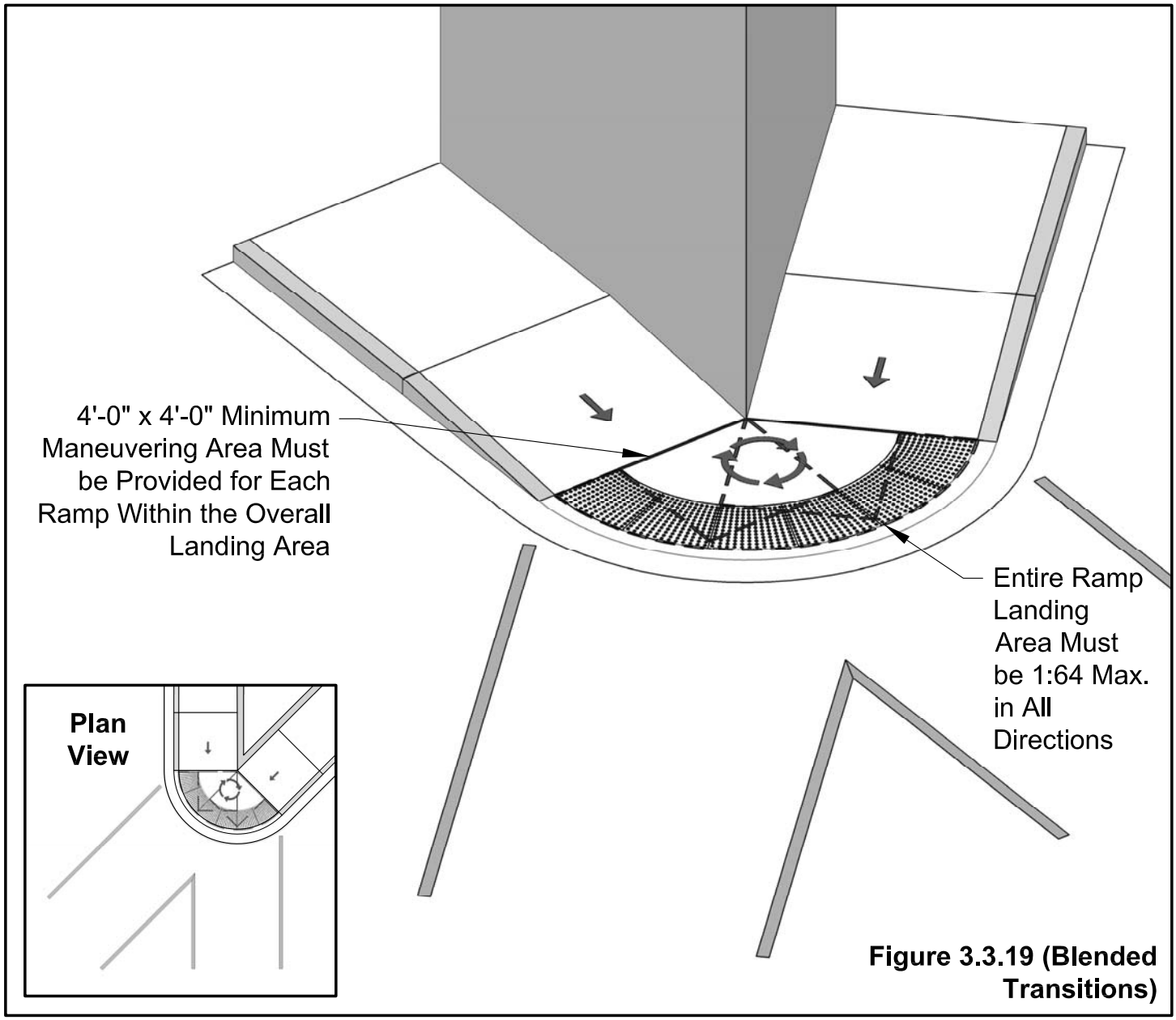


Figure 3.3.19 (Blended Transitions)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.3 Blended Transitions (cont.)

Narrow sidewalks situated adjacent to larger curb radii may incorporate a very large ramp landing area and section of depressed curb. The intersection geometry and crosswalk layout may not allow for the entire depressed curb area to fall within the striping of the crosswalk, although this is preferable if possible. Ideally, the bottom edge of the ramp matches the outer crosswalk stripe. Where the curb is depressed and the street and sidewalk are flush, regardless of crosswalk striping configuration, the detectable warning surface must be provided. (Figure 3.3.20)

It is important to maintain a functional flowline to ensure that proper drainage is maintained.

Designs situated about large curb radii as seen in Figure 3.3.20 may result in large turning vehicles that drive over the depressed curb and detectable warning surface, causing damage to the detectable warning and putting the pedestrians waiting to cross the street in conflict with vehicular traffic encroaching in the pedestrian way. This design alternative should only be used when all other options are exhausted.

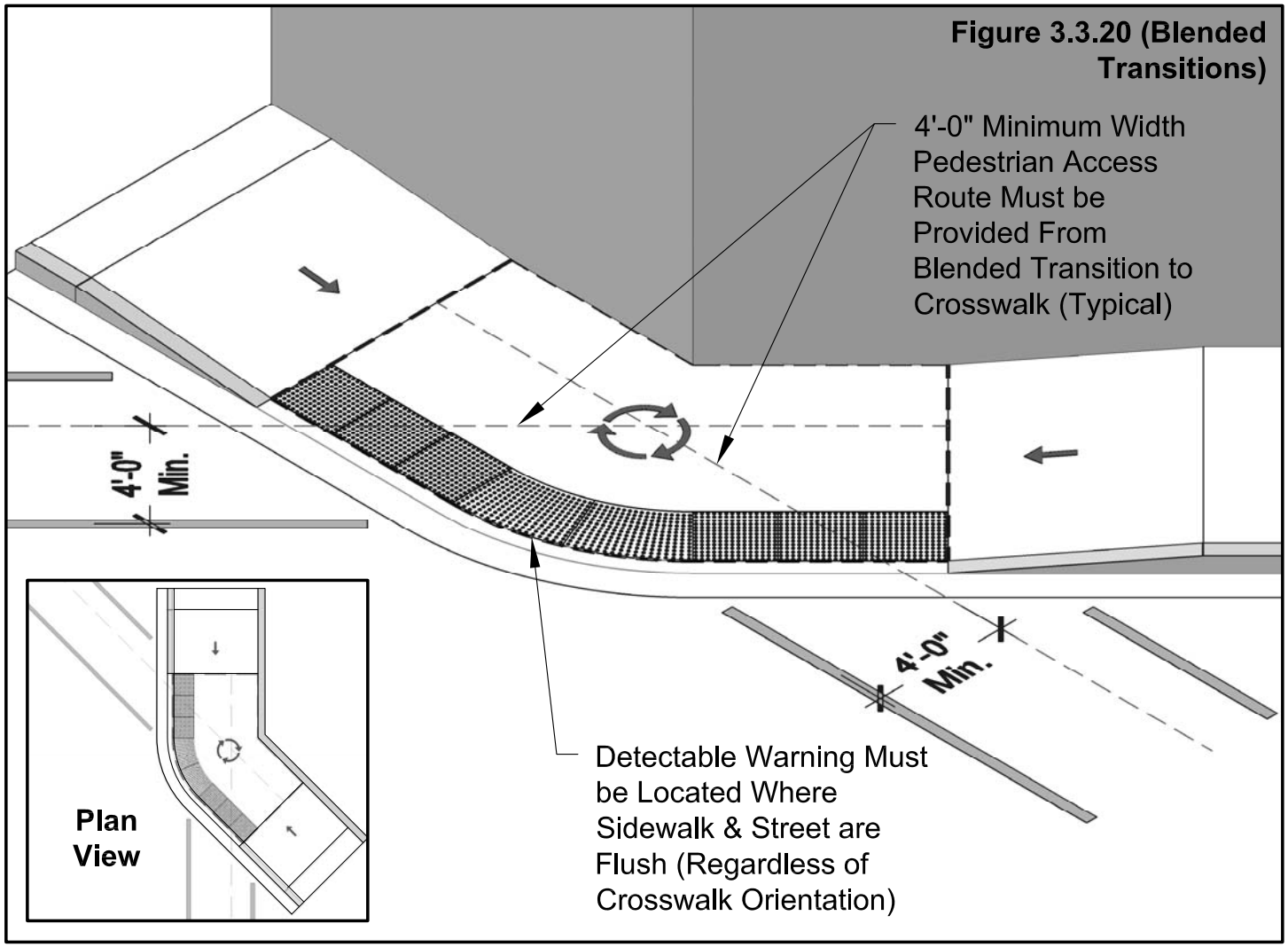


Figure 3.3.20 (Blended Transitions)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.3 Blended Transitions (cont.)

Ramps should not be designed to curve or turn, due to the potential difficulties involved for some pedestrians with mobility devices that are forced to turn as the ramp is ascended or descended. However, for narrow sidewalks at large curb radii requiring a blended transition design, it is acceptable for the ramp run to be perpendicular to a radial curb line. The grade breaks of the ramp, top and bottom, must be perpendicular to the path of travel; the path of travel should be parallel to the curb as one ascends or descends along the ramp run. (Figure 3.3.21)

In some instances, the curb radius may be designed to handle vehicular traffic concerns primarily and pedestrian movement is secondary. Rather than depressing the entire corner, it is preferable to provide two distinct pedestrian crosswalk entry points, each relative to the crosswalk being served. (Figure 3.3.22, next page)

The section between the two ramp landing areas should be separated by standard sidewalk running slopes (1:24 max.). If ramp slopes are required, a top ramp landing must be provided between the two ramps (width of the sidewalk x 4 foot depth min.). Refer to Figure 3.3.22 for additional notes for this type of layout.

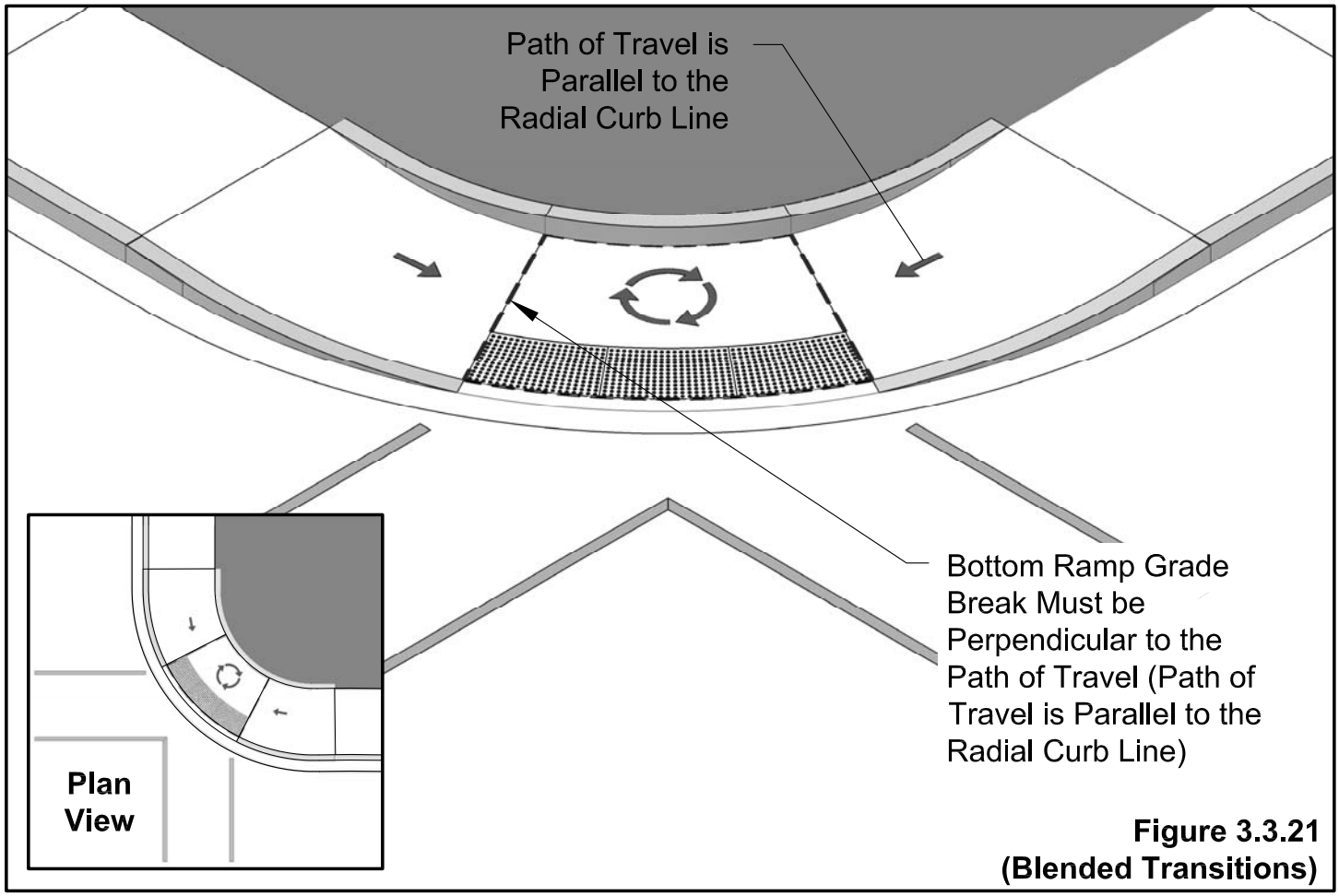


Figure 3.3.21 (Blended Transitions)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.3 Blended Transitions (cont.)

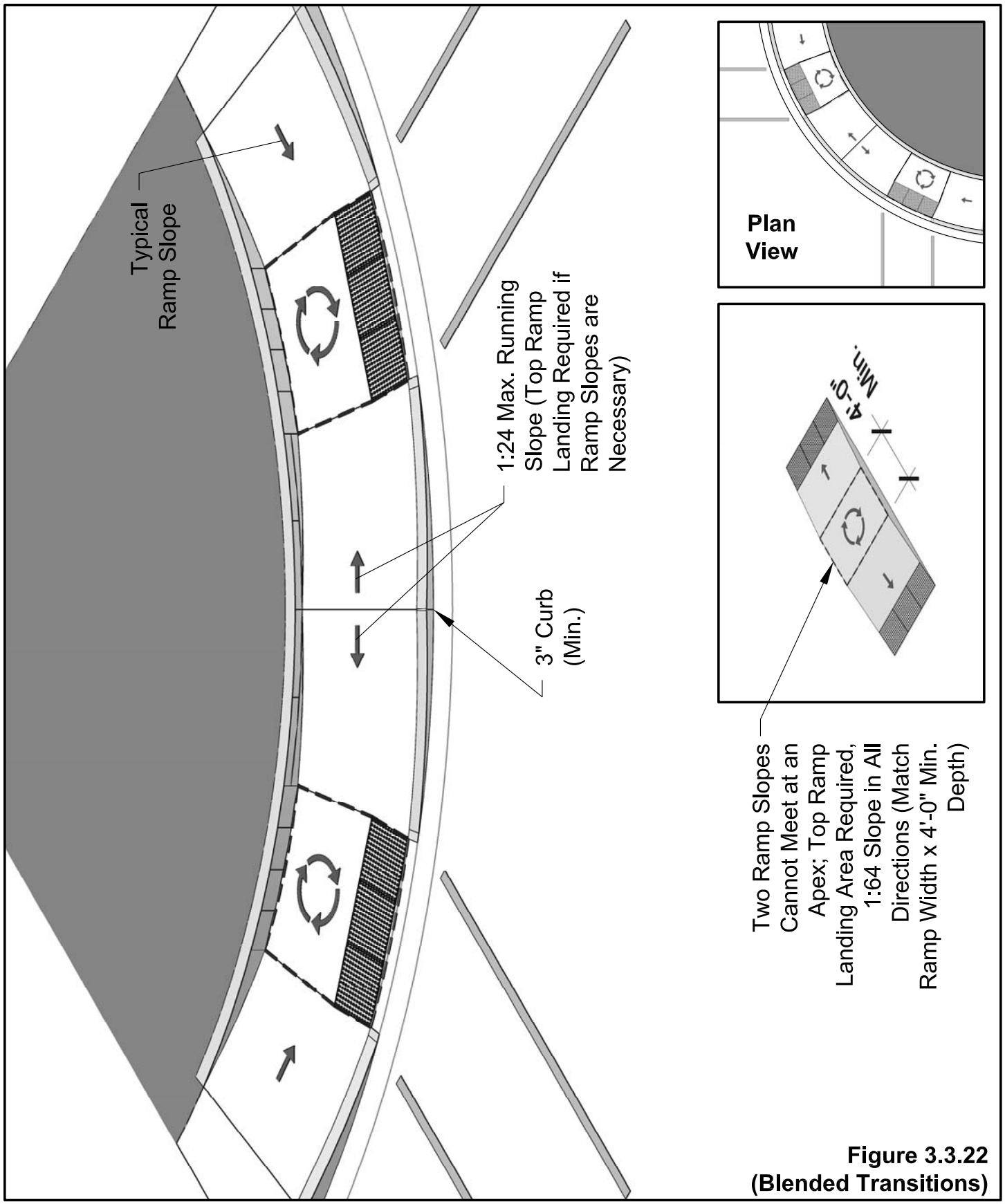


Figure 3.3.22
(Blended Transitions)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.4 Combination Ramps

When the elevation difference from the existing street up to the sidewalk is greater than the typical 6 inch curb. A combination curb ramp (perpendicular and parallel ramps) may be installed which will create a more desirable pedestrian option than depressing the entire corner (as seen on a blended transition). (Figure 3.3.23)

Provided that the corner in question has no existing facility entrance or other site constraints, the main line sidewalk can be sloped down with a typical ramp running slope to an intermediate landing. From this point, a standard two perpendicular ramp design can be applied. The main line sidewalk, adjacent to the property line or face of building, ramps down to this intermediate landing while all cross slope maximums are applied (1:64 max.). It is acceptable to transition the sidewalk adjacent to the top ramp edges down to the curb and the bottom ramp side flares. This transitional sidewalk cannot exceed 1:12 slope, similar to the ramp side flare requirements. (Figure 3.3.23)

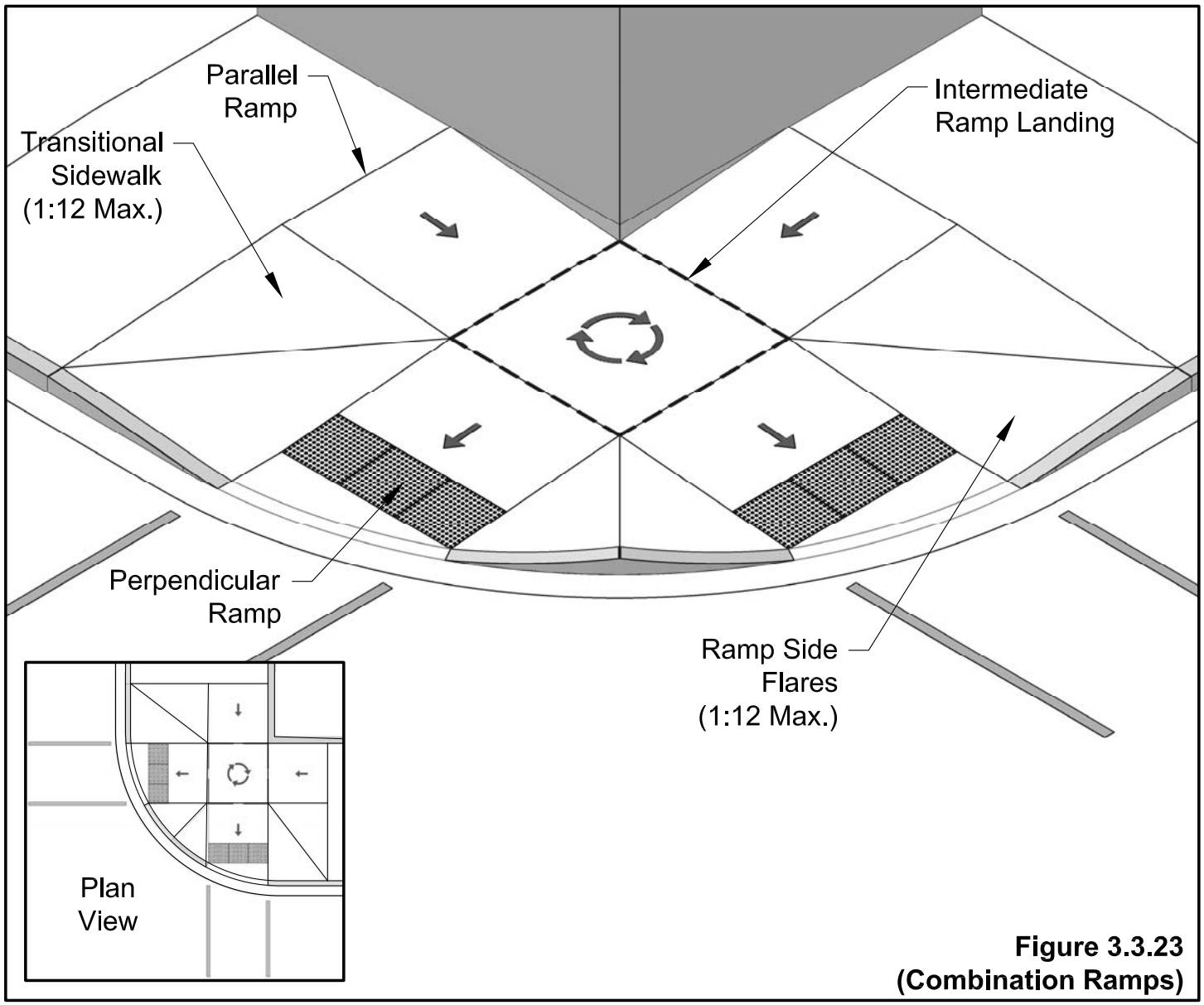


Figure 3.3.23 (Combination Ramps)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.4 Combination Ramps (cont.)

In residential areas or locations with parkways or other barriers limiting the pedestrian flow to the main line portion of the sidewalk as shown in Figure 3.3.24, side curbs can be used to retain the adjacent landscaping or the adjacent surface can be regraded to match the ramp runs. The number of grade breaks is limited and the ramp becomes simpler and more constructible.

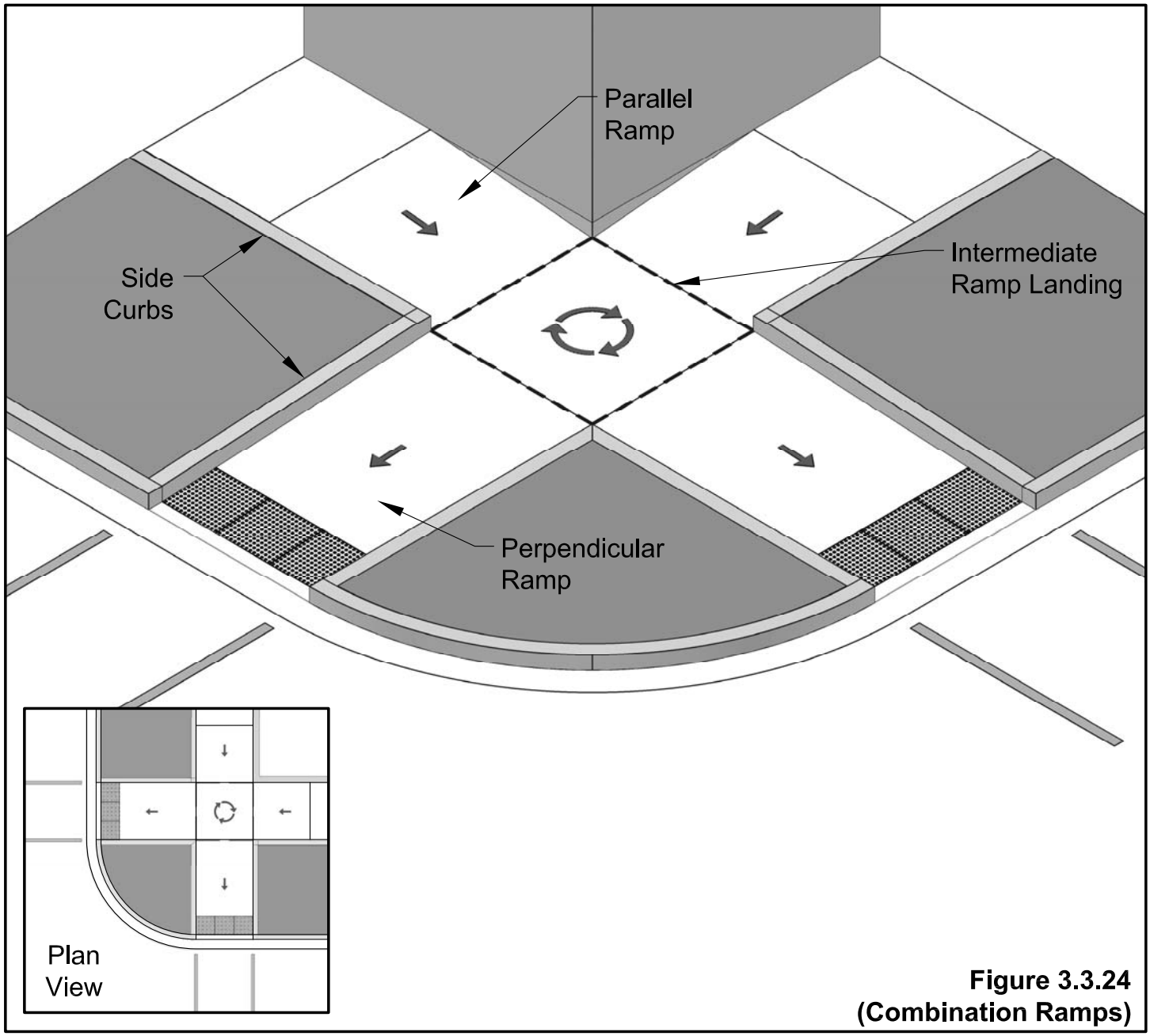


Figure 3.3.24 (Combination Ramps)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.5 Diagonal Ramps

A diagonal ramp is a single ramp running perpendicular to the curb at a 45 degree angle (to the middle of the radius). The intent of this ramp is to provide access to both crosswalks with a single ramp. **This design is the least desirable and should only be used when all other design options have been exhausted.** (Figure 3.3.25)

Diagonal ramps direct pedestrians to travel towards the center of the intersection, resulting in the need for a change of direction within the street toward one of the two crosswalks for the intended path of travel.

The diagonal ramp, in addition to being the least preferred design choice at an intersection, also has unique requirements beyond the standard curb ramp requirements due its orientation. These special requirements are as follows:

1) A 4 foot by 4 foot minimum clear maneuvering area must be located behind the extended faces-of-curb which allows for maneuvering behind the vehicular travel lanes.
2) Crosswalk striping must be located 2 feet minimum from top of side flare to assist the visually impaired in establishing orientation within the safety of the crosswalk.

Refer to Figure 3.3.26, next page, for clarification.

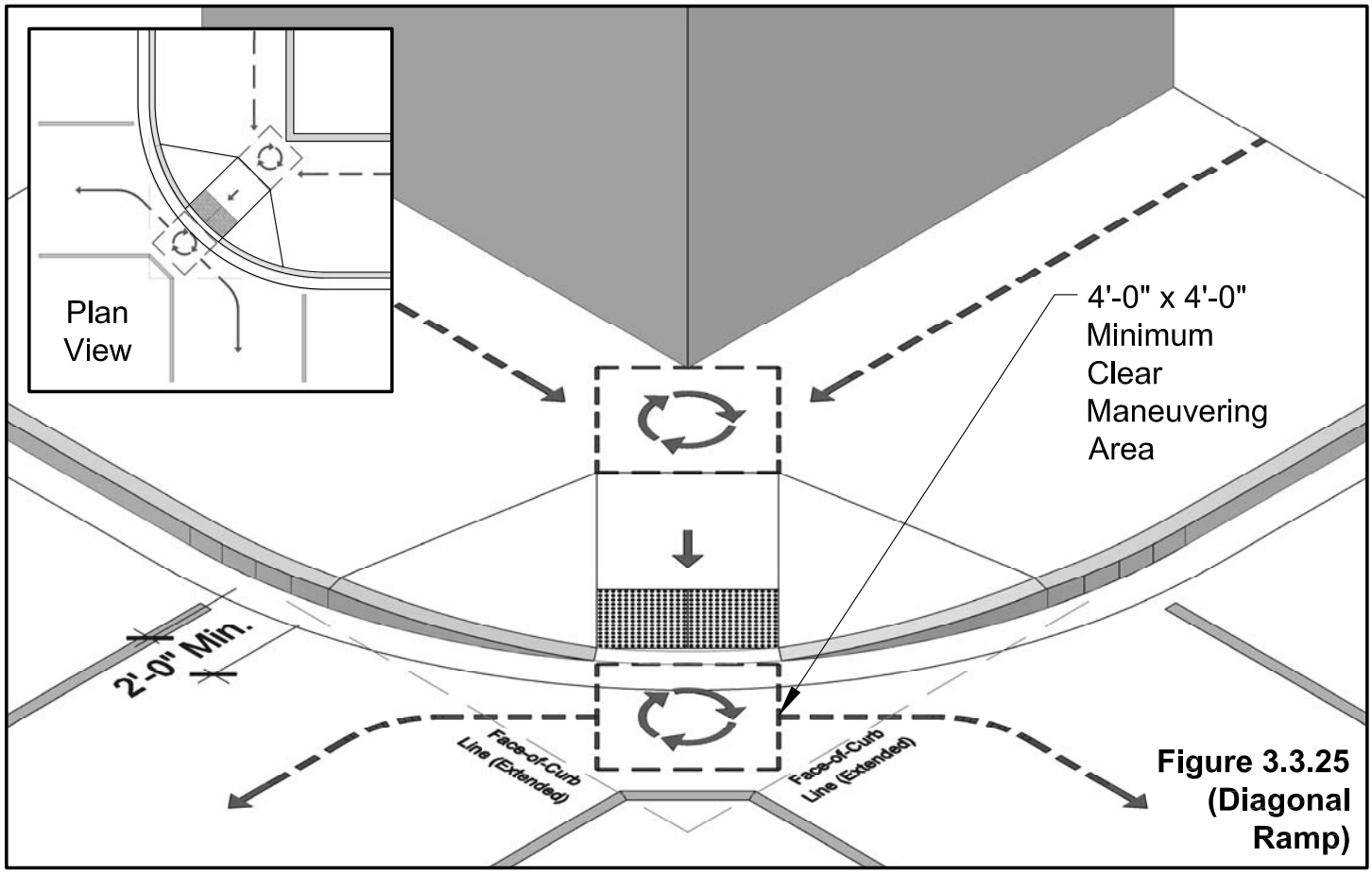


Figure 3.3.25 (Diagonal Ramp)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.5 Diagonal Ramps (cont.)

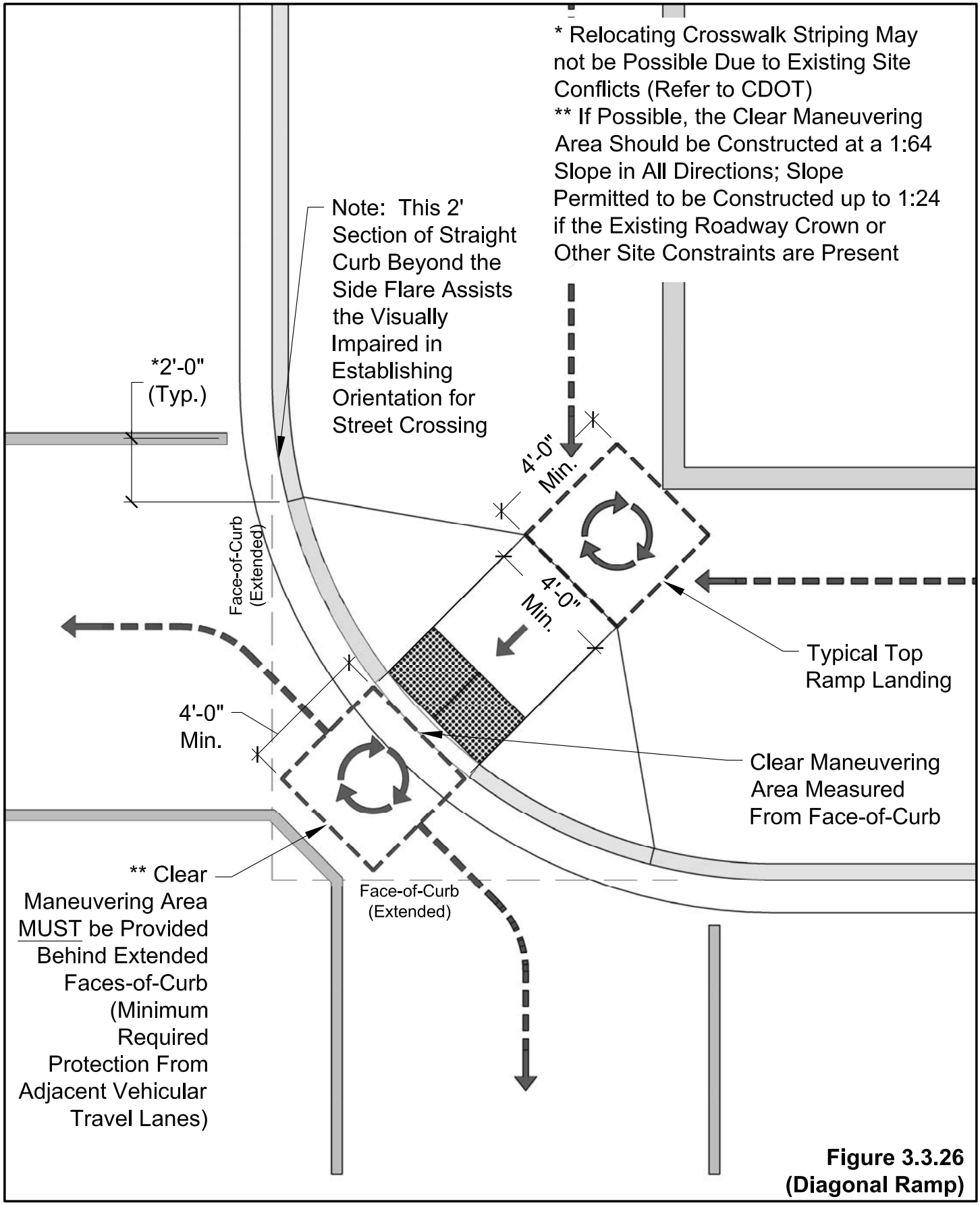


Figure 3.3.26 (Diagonal Ramp)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.5 Diagonal Ramps (cont.)

The geometry of some intersections may favor a diagonal ramp rather than attempting to fit two ramps in a small amount of space. As seen in Figure 3.3.27, the clear maneuvering area at the base of the ramp is well behind the faces of curb extended and protected from the adjacent vehicular lanes. A wheelchair user can safely turn at the base of the ramp and approach the desired crosswalk without much additional effort.

Other intersection geometries will not allow for a diagonal ramp under any circumstances. As seen in Figure 3.3.28, due to the existing curb and street orientation, a maneuvering area cannot be provided behind the faces of curb and clear of the adjacent vehicular lanes. This condition does not allow for a wheelchair to turn and maneuver in a safe location, and therefore is not permitted.

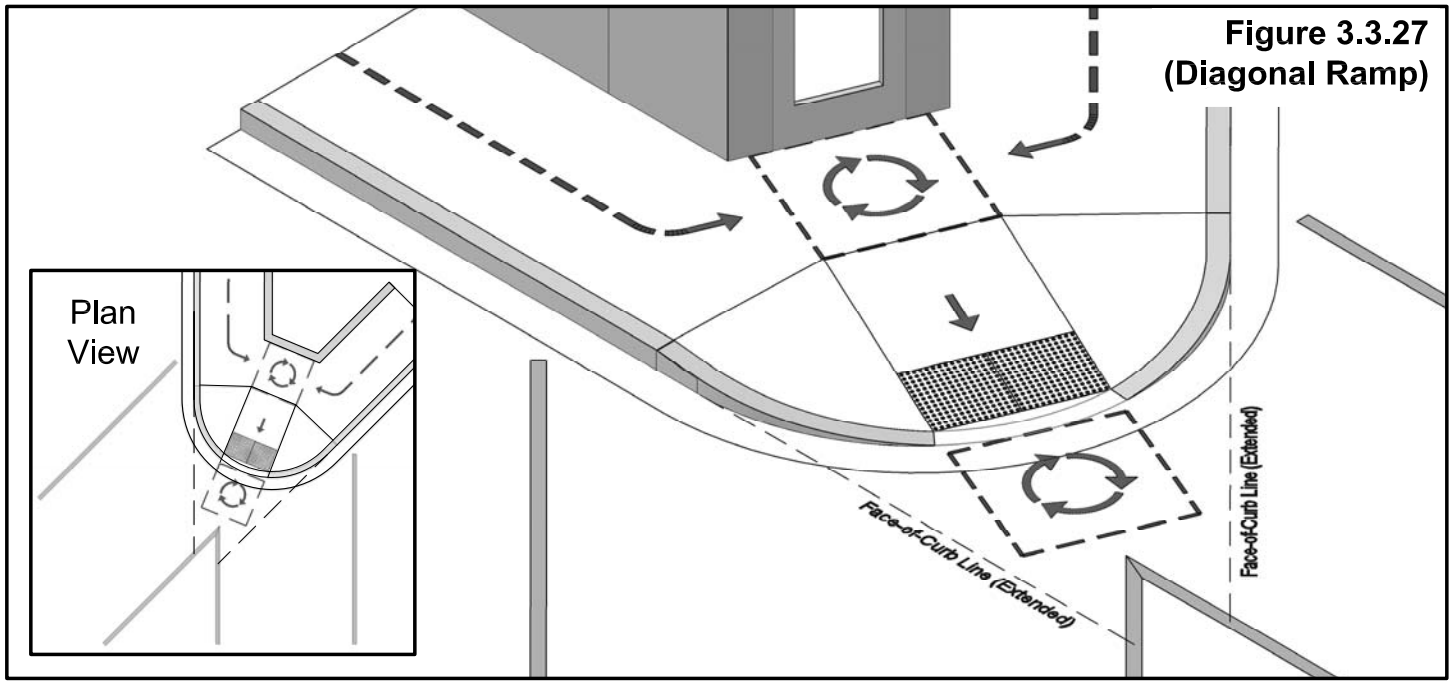


Figure 3.3.27
(Diagonal Ramp)

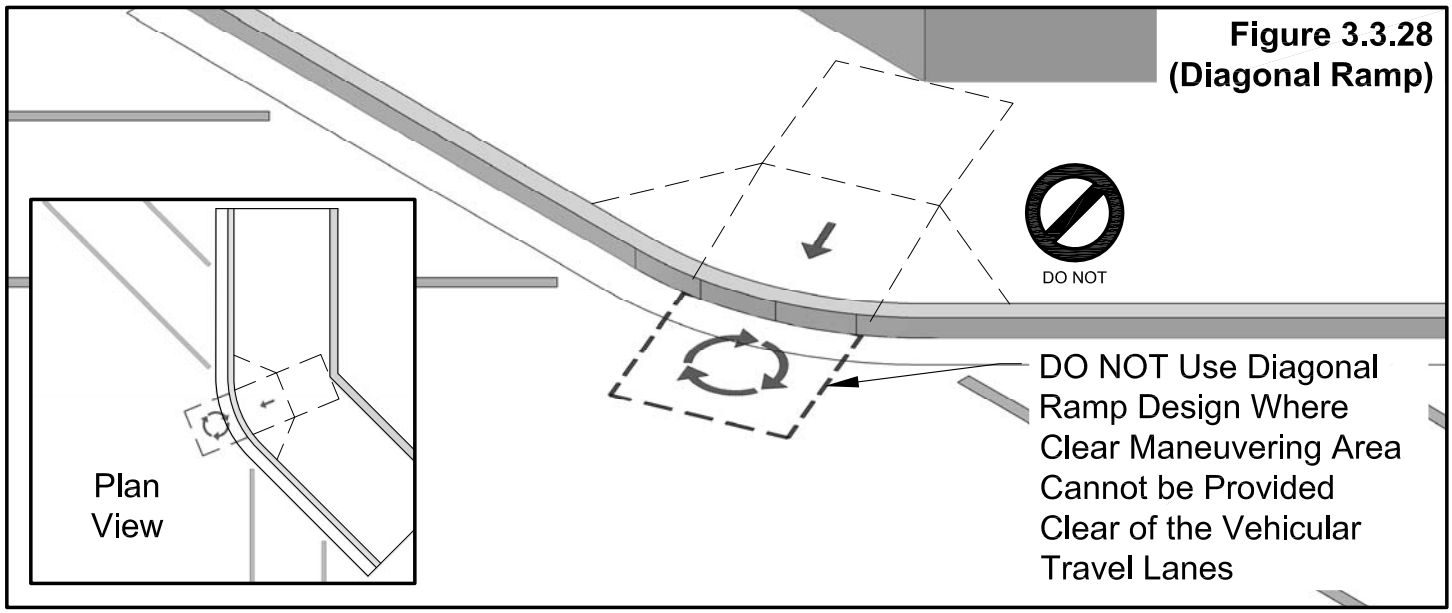


Figure 3.3.28
(Diagonal Ramp)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.6 One-Way Ramps at Corners

Some intersections may not include a pedestrian crossing in each direction. Where the pedestrian flow is limited to a street crossing in only one direction, it is important to provide clear information to the visually impaired. The slope of the curb ramp, side flares, and placement of detectable warning surface should be located in the best possible location to give the visually impaired the cues needed to interpret the crossing location and orientation.

The ideal condition for a one-way ramp design at a corner would employ the standard perpendicular ramp. The grade breaks and side flares of this design provide good information regarding the orientation of the open crosswalk. It is extremely important that ambiguous information is not provided that would suggest an available street crossing in the perpendicular direction that is closed due to safety or other concerns. (Figure 3.3.29)

Refer to Sections 4.0 & 5.0 for important information regarding detectable warning alignment and accessible street crossings.

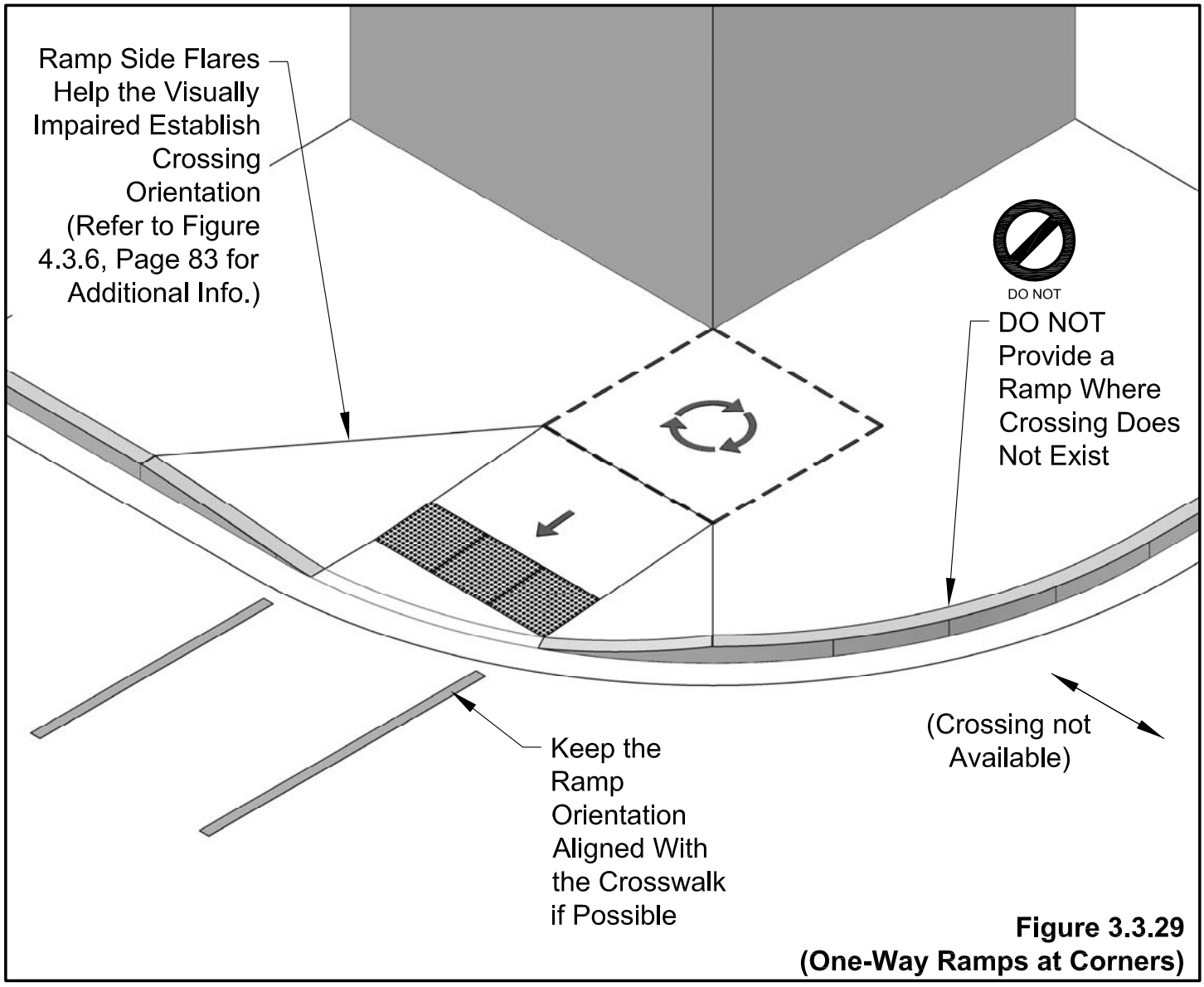


Figure 3.3.29
(One-Way Ramps at Corners)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.3.6 One-Way Ramps at Corners (cont.)

If a blended transition design must be used at a corner with limited available right-of-way and with only one available pedestrian street crossing, it is important to design the ramp to provide the proper cues for the visually impaired. The entire corner should not be depressed, as a pedestrian may interpret a crossing where it is not safe or possible. (Figure 3.3.30)

The design should be configured in a way that informs the pedestrian of the orientation of the available street crossing. Careful location and/or orientation of the detectable warning surface, the curb, and flaring of the sidewalk results in a corner that provides access and enough cues to assist the visually impaired. (Figure 3.3.31)

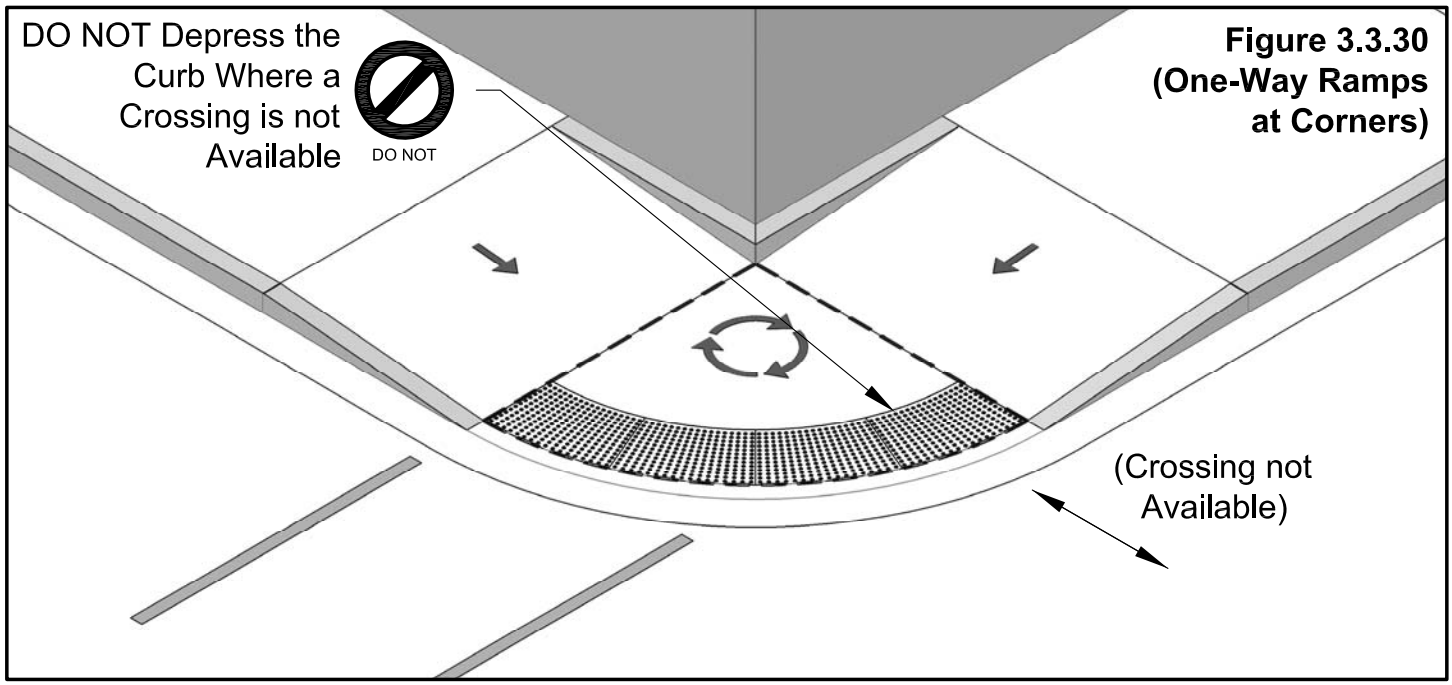


Figure 3.3.30 (One-Way Ramps at Corners)

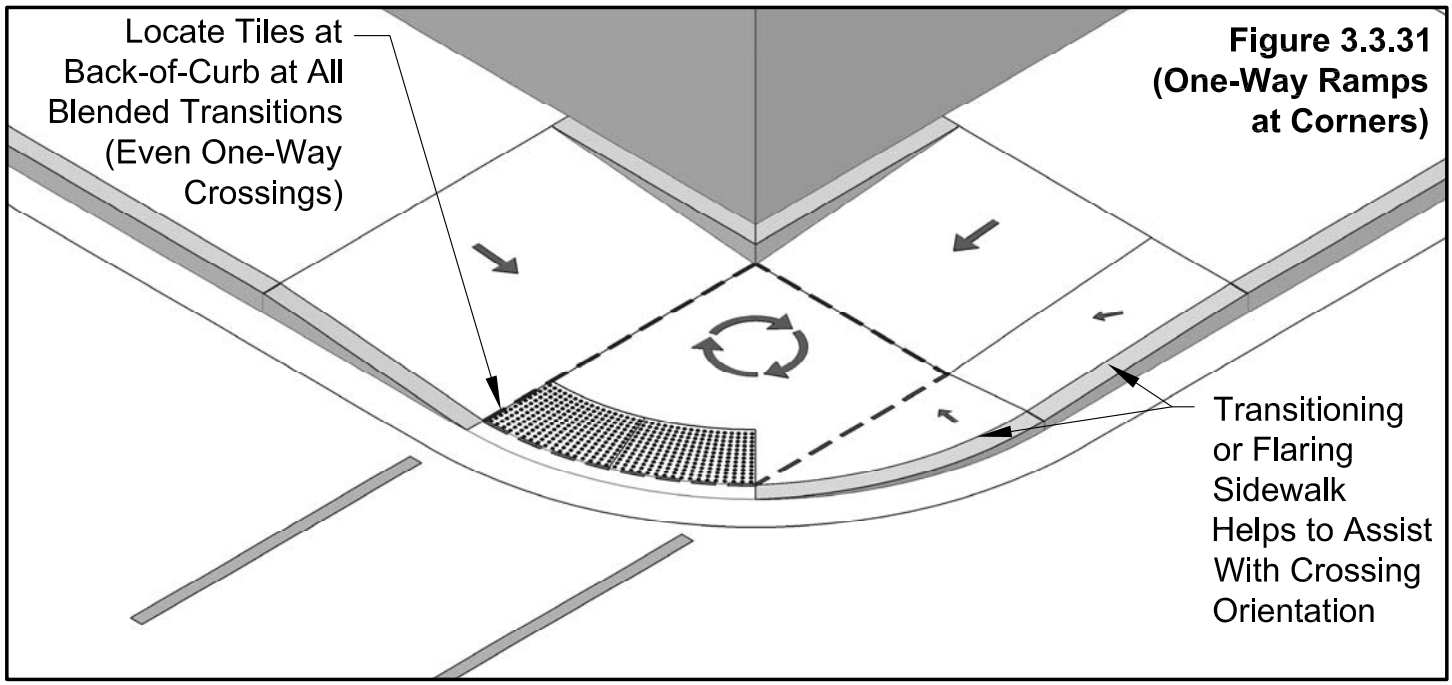


Figure 3.3.31 (One-Way Ramps at Corners)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.4 Curb Ramps - Ramps at Alleys & Driveways

Curb ramps may be necessary to cross alleys and driveways installed at a lower elevation than the adjacent sidewalks. Sidewalks may be designed to cross an alley or driveway at a consistent elevation, eliminating the need for pedestrians to ramp up or down to make the crossing. Where necessary, typical curb ramp requirements must be followed (refer to Section 3.1 for additional information). (Figures 3.4.1, 3.4.2)

Good design practice would locate a ramp at an alley or driveway crossing at the back of the sidewalk where the majority of pedestrians travel. Additionally, if a building, a permanent barrier, or a non-pedestrian way abuts the ramp, it is not necessary to flare or transition the sidewalk where there may be a limited amount of right-of-way.

Refer to Section 6.0 for information regarding alleys and driveways.

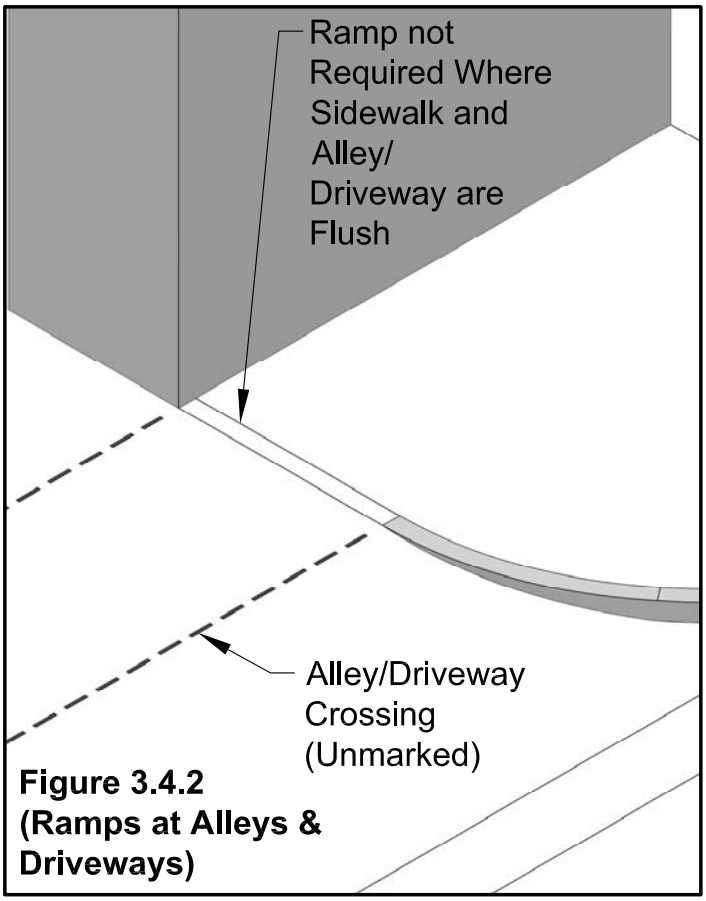


Figure 3.4.2 (Ramps at Alleys & Driveways)

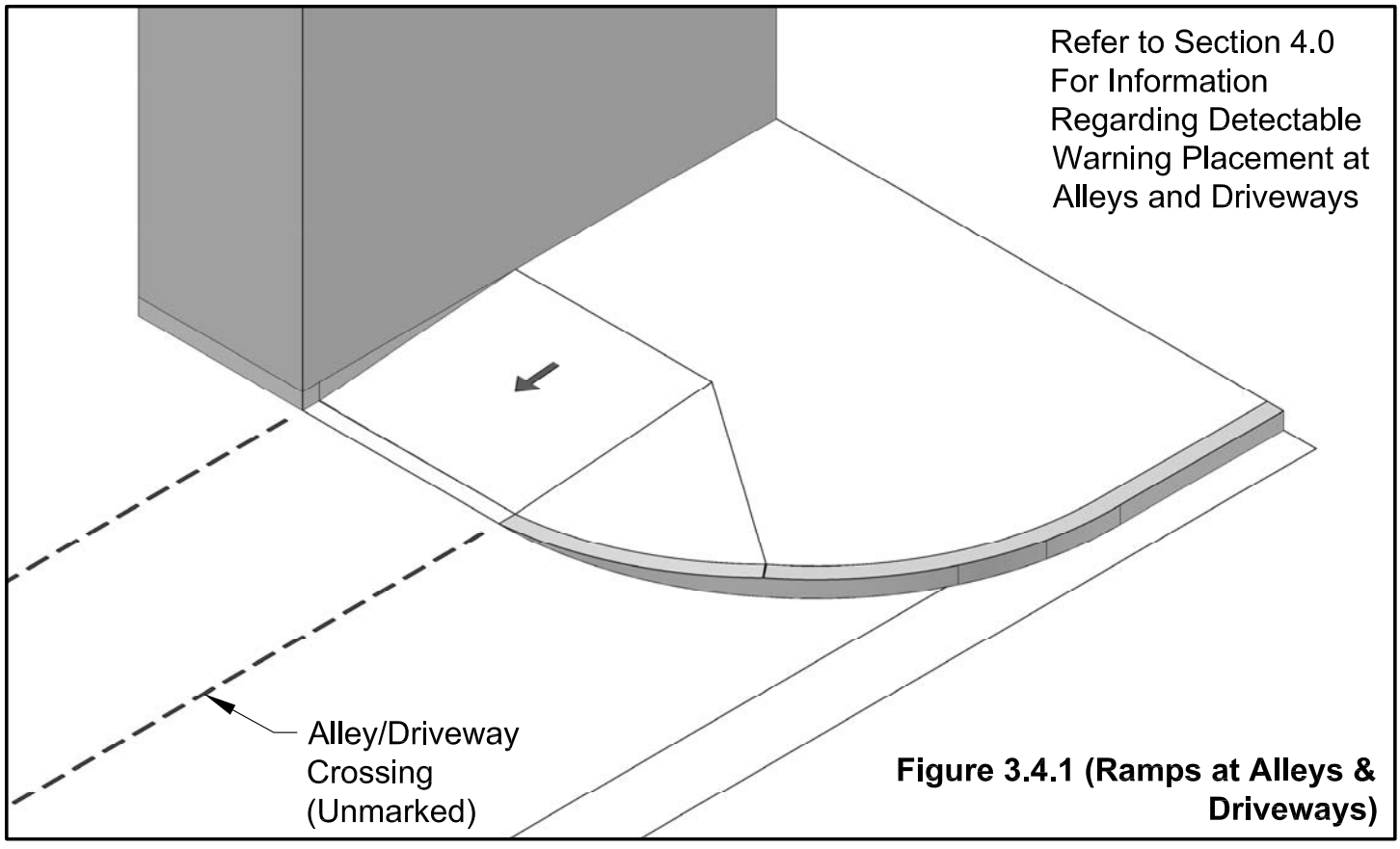


Figure 3.4.1 (Ramps at Alleys & Driveways)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.5 Curb Ramps - Design Issues

3.5.1 Overview

Constructing fully compliant curb ramps can occasionally prove to be challenging. Though impossible to foresee every potential issue, listed below are some of the more frequently repeated challenges and design issues in curb ramp design and installation.

Design Issues:

1) Significant Elevation Difference Between Street and Sidewalk
2) Limited Available Right-of-Way and/or Narrow Sidewalks
3) Convergence of Sidewalks with Differing Widths
4) Large Curb Radii at Intersections
5) Utility Structure in Ramp that cannot be Adjusted or Relocated
6) Ramp at Base of Permanent Structure (Bridges, Overpasses)
7) Doorways at Alley or Driveway Crossings

The following design options may be possible solutions towards the provision of accessible curb ramps in locations with existing site constraints. It may be necessary to combine some of these design techniques to fit accessible ramps in difficult locations.

Design Options:

A) Minor Pavement Raise
B) Reduction of Ramp Widths to Increase the Length of Ramps
C) Reduction of Curb Radius to Increase the Length of Ramps
D) Bump-Out Designs*
E) Raised Crosswalk Designs*
F) Built-Up Curb Ramps*
G) Diverging Sidewalks
H) Offsetting of Curb Ramp and Crosswalk

*** Implementing this design must not negatively impact drainage nor the safe flow of traffic and is subject to the approval of traffic engineers. This design is not preferred and should not be used unless all other options are exhausted.**

Section 3.5.2 graphically portrays each of these design issues and potential solutions and are referenced to the number or letter assigned to them as shown in the listing above.

3.5 Curb Ramps - Design Issues (cont.)

3.5.2 Design Options

Design Issue:

1) Significant elevation difference from street to sidewalk.

Description:

Due to the difference in elevation from the existing street level up to the property line at an existing facility, the preferred two perpendicular ramp design does not provide the necessary ramp run to connect the two. The result is either the creation of a step adjacent to the existing facility or a drop-off at the base of the proposed ramp to the existing street level, both of which are inaccessible and not compliant. (Figure 3.5.1)

Design Option(s):

A) Slightly raise the pavement to make the base of the proposed curb ramp and the existing street connect while maintaining the maximum allowable ramp slope. This pavement raise must not negatively impact the existing drainage or traffic flow. (Figure 3.5.2, next page)

B) Reduce ramp widths to maximize ramp run. (Figure 3.5.3, next page)

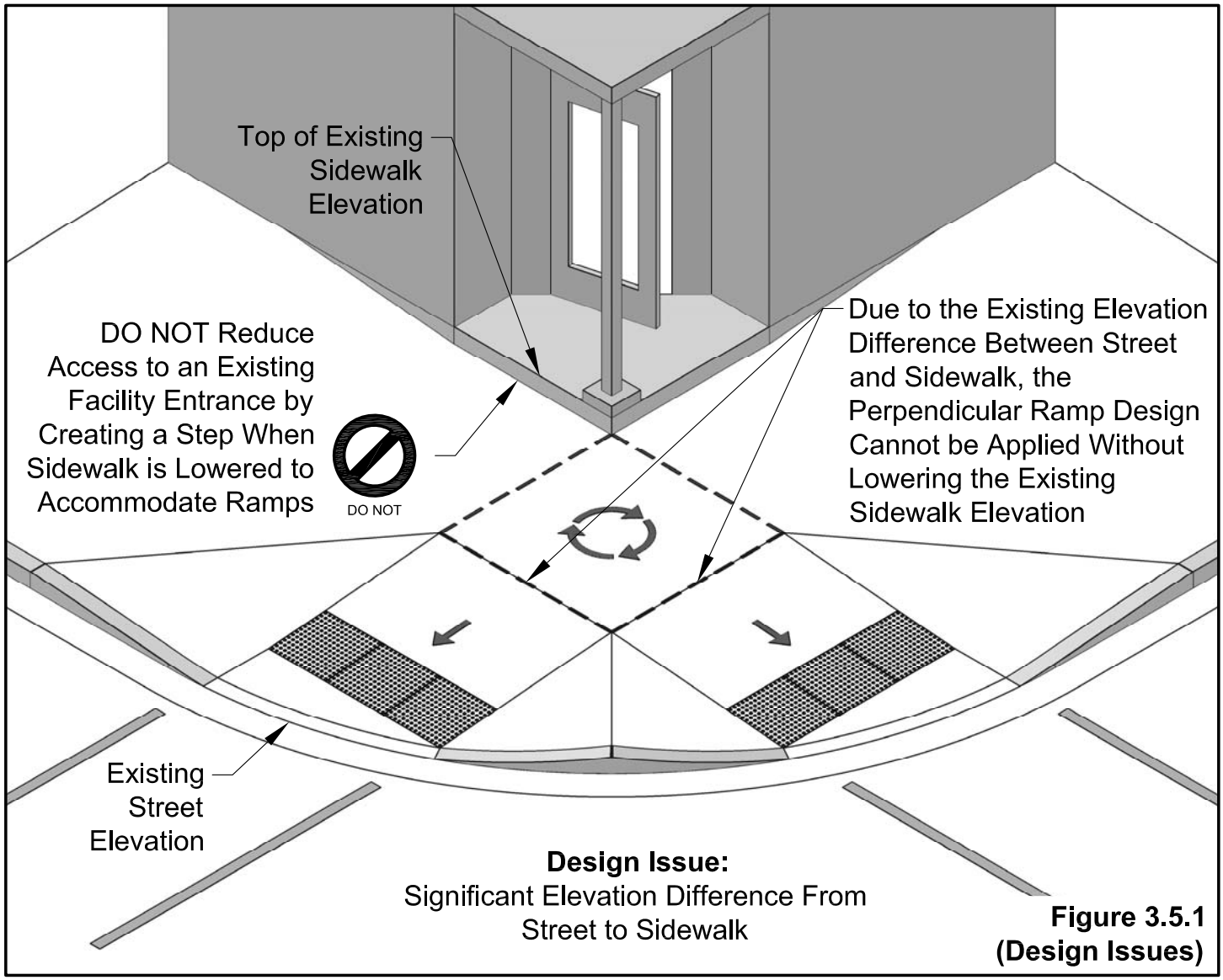
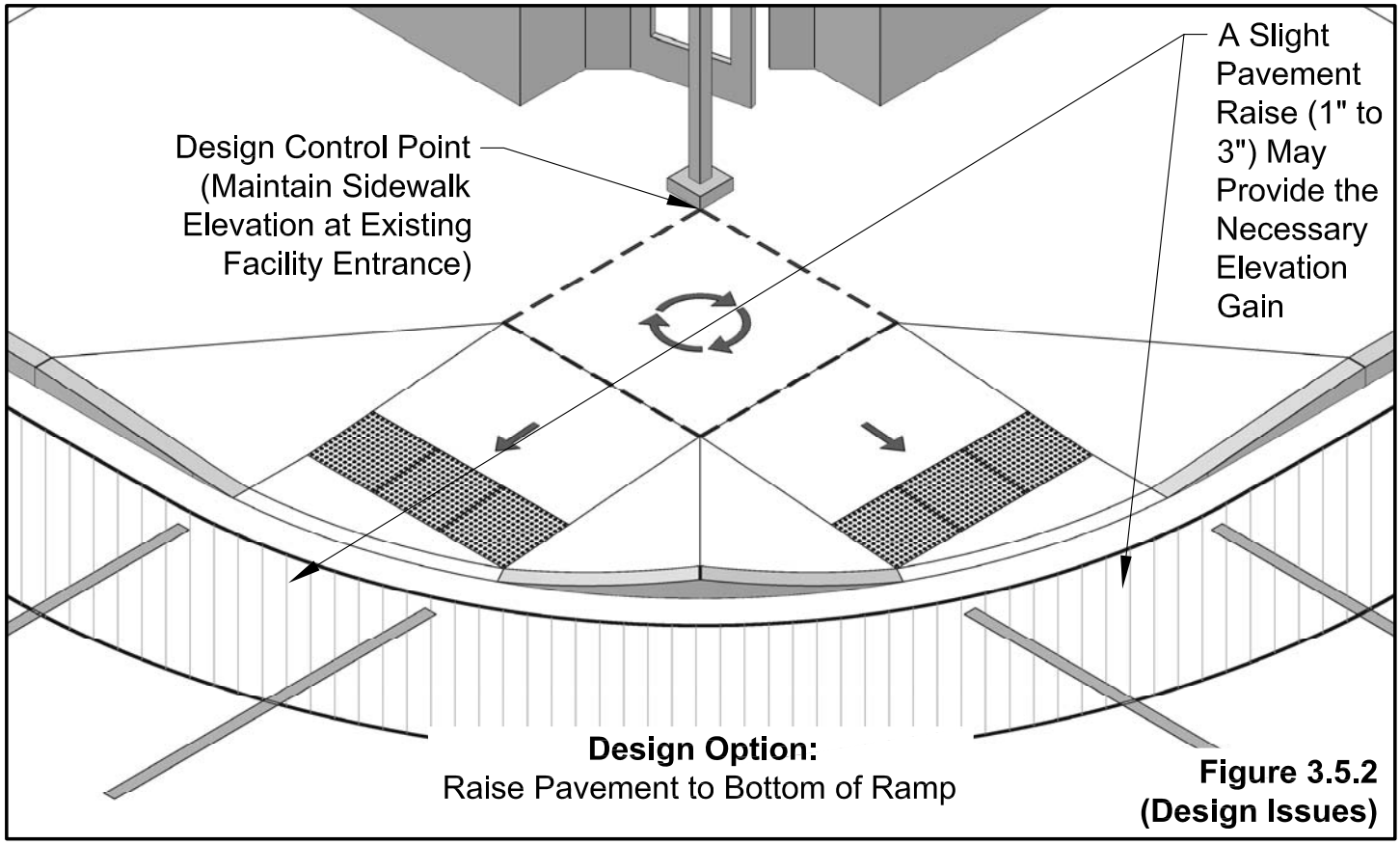


Figure 3.5.1 (Design Issues)

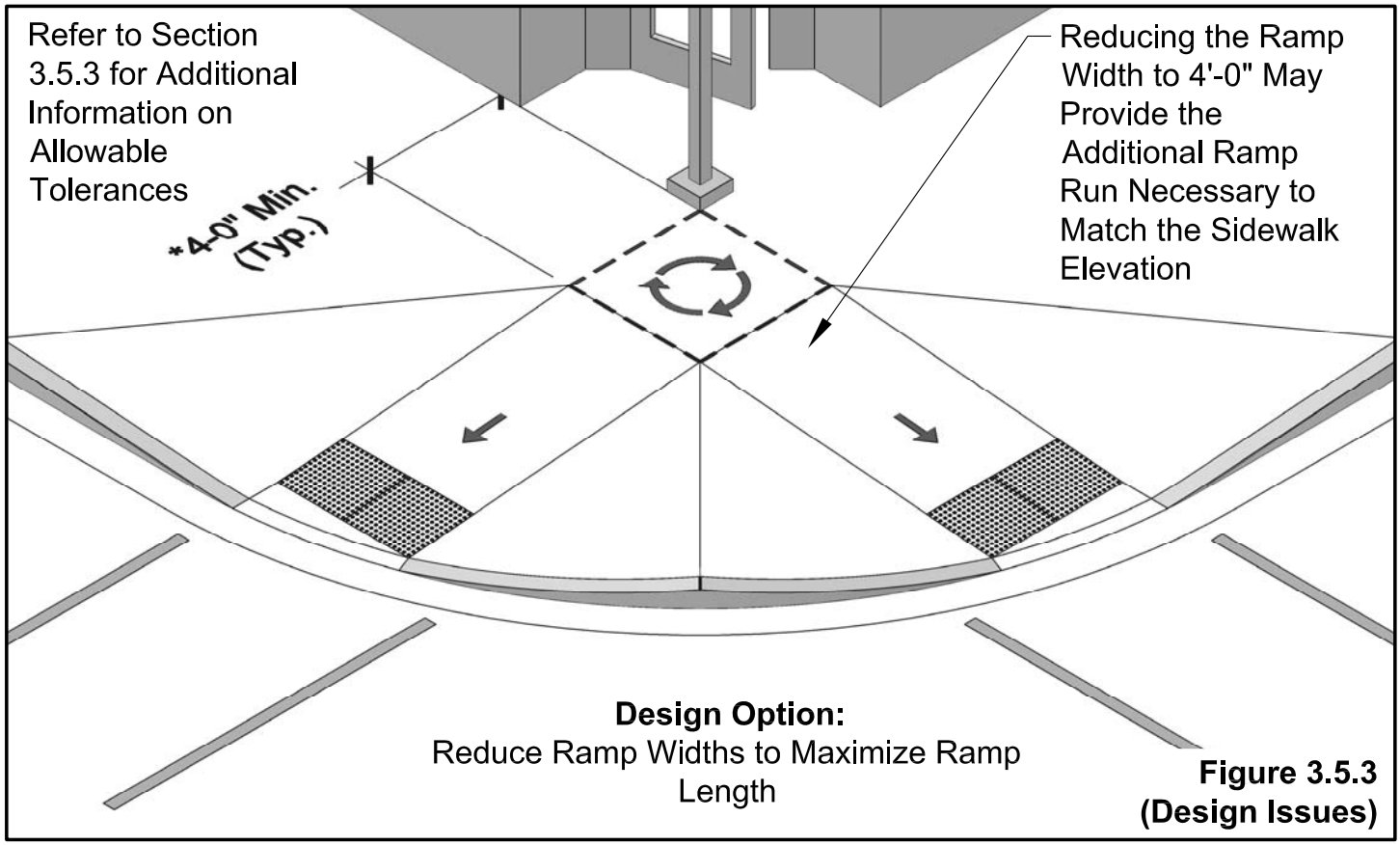
Note: Refer to Section 3.1 for typical curb ramp requirements.

3.5.2 Design Options (cont.)



Design Option:
Raise Pavement to Bottom of Ramp

Figure 3.5.2
(Design Issues)



Design Option:
Reduce Ramp Widths to Maximize Ramp Length

Figure 3.5.3
(Design Issues)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.5.2 Design Options (cont.)

Design Issue:

2) Limited available right-of-way and/or narrow sidewalks.

Description:

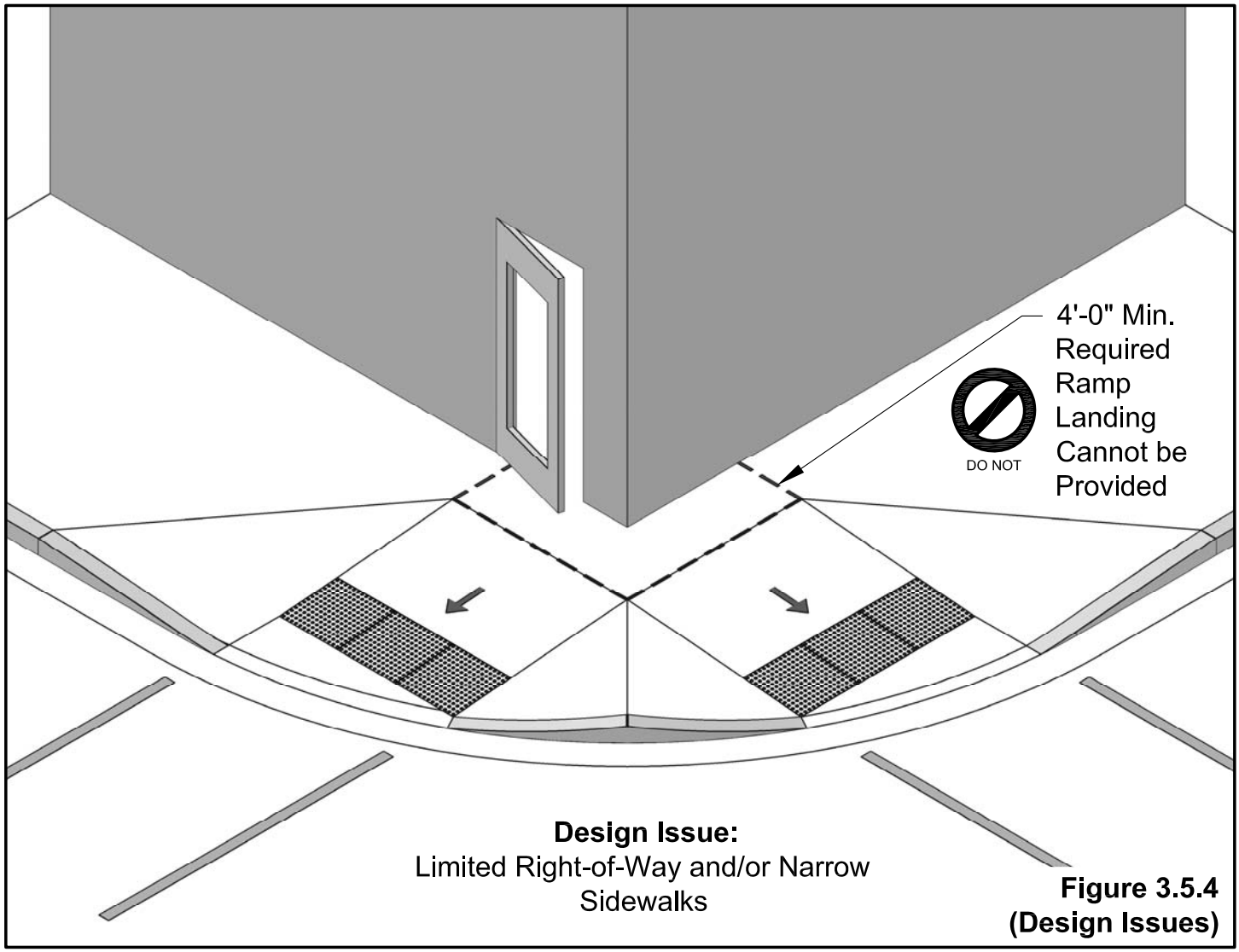
Because of the proximity of the existing curb to the face of building or property line, there is not enough available sidewalk area to fit the preferred two perpendicular ramp design. While the ramps themselves may fit, the minimum ramp landing depth cannot be provided, resulting in a non-compliant ramp design. (Figure 3.5.4) It should be noted that a blended transition design cannot be applied here because access to the existing facility would likely be reduced.

Design Option(s):

B) Reduce ramp widths to maximize ramp run. (Figure 3.5.5, next page)

C) Reduce curb radius to gain additional required ramp run. Any reduction of the curb radius is subject to the approval of traffic engineers and must still satisfy the demands of the existing vehicular traffic patterns. (Figure 3.5.5, next page)

D) Implement bump-out design to gain additional required ramp run. (Figure 3.5.6, next page)

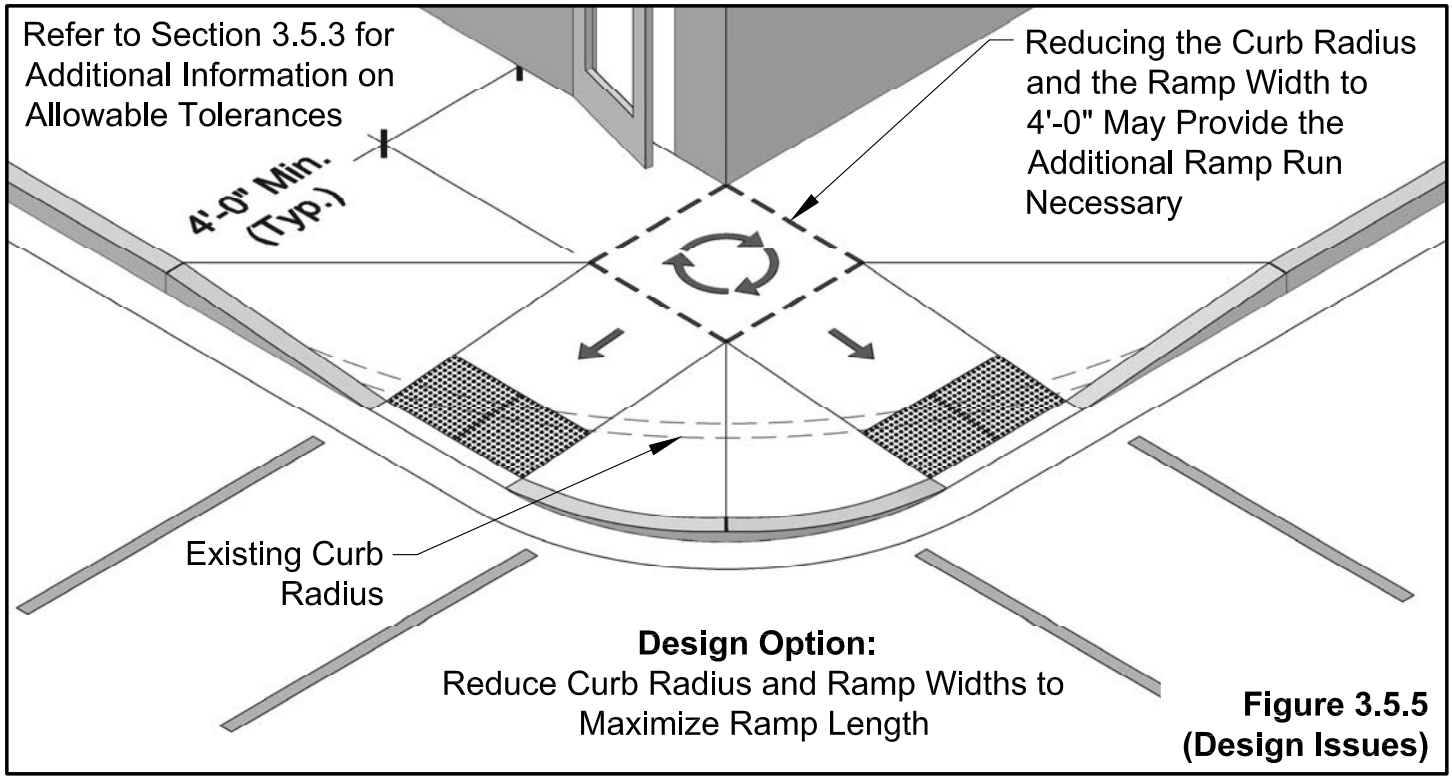


Design Issue:
Limited Right-of-Way and/or Narrow Sidewalks

Figure 3.5.4 (Design Issues)

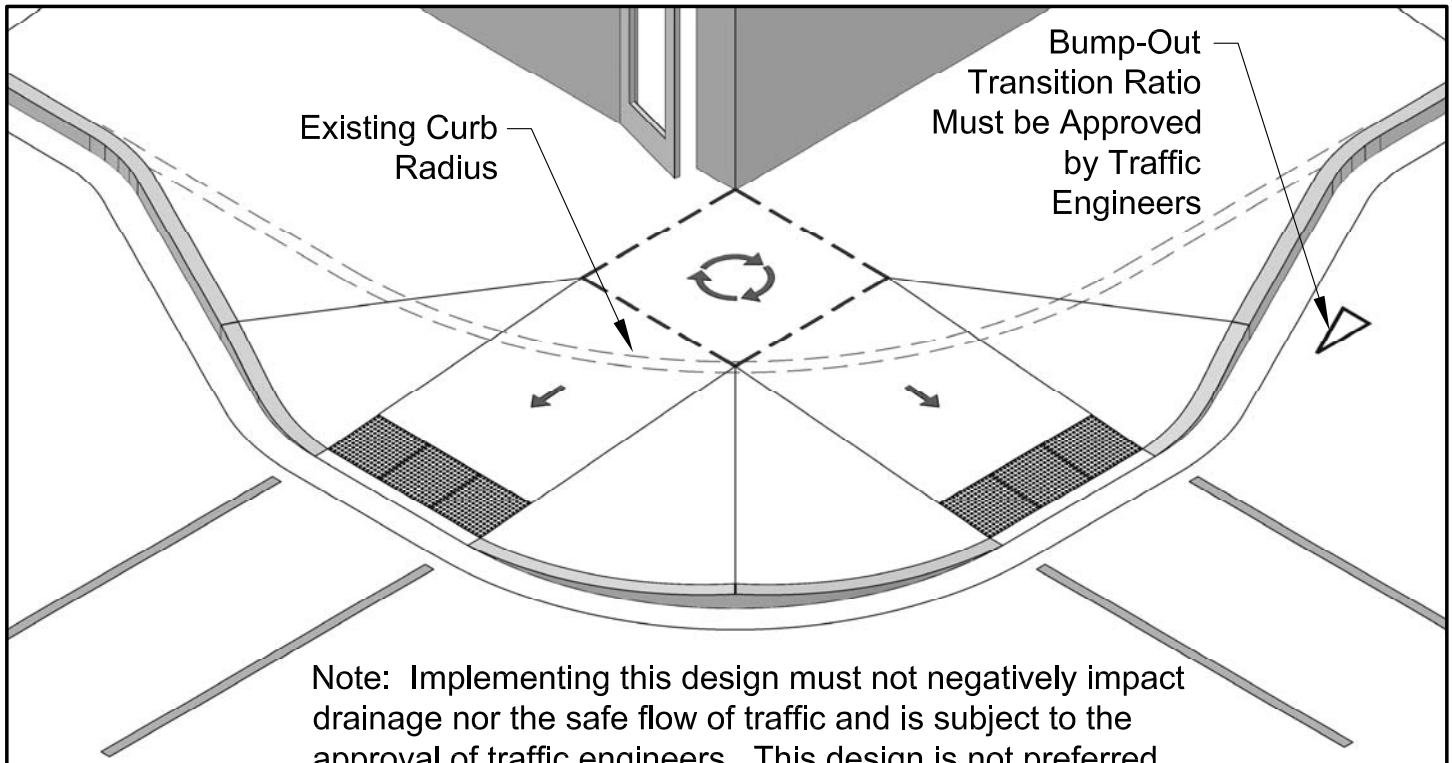
Note: Refer to Section 3.1 for typical curb ramp requirements.

3.5.2 Design Options (cont.)



Design Option:
Reduce Curb Radius and Ramp Widths to Maximize Ramp Length

Figure 3.5.5 (Design Issues)



Note: Implementing this design must not negatively impact drainage nor the safe flow of traffic and is subject to the approval of traffic engineers. This design is not preferred and should not be used unless all other options are exhausted.

Design Option:
Bump-out Design

Figure 3.5.6 (Design Issues)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.5.2 Design Options (cont.)

Design Issue:

2) Limited available right-of-way and/or narrow sidewalk at mid-block crossing.

Description:

Because of the proximity of the existing curb to the face of building or property line, there is not enough available sidewalk to fit the preferred perpendicular ramp design. While the ramp itself may fit, the minimum ramp landing depth cannot be provided, resulting in a non-compliant ramp design. (Figure 3.5.7) In addition, a parallel ramp design cannot be applied because access to the existing facility would be reduced.

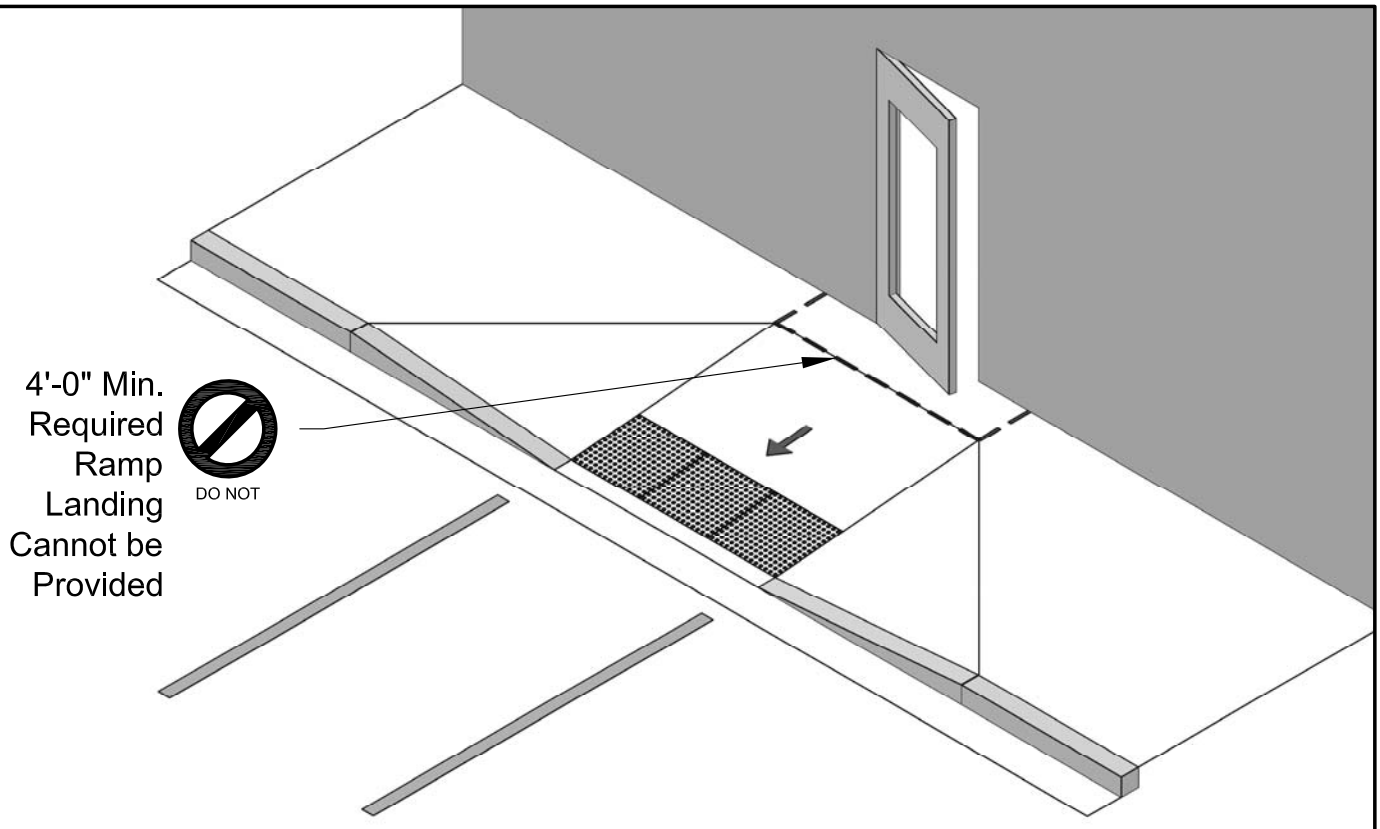
Design Option(s):

E) Provide raised crosswalk.* (Figure 3.5.8, next page)

F) Provide built-up curb ramp.* (Figure 3.5.9, next page)

Refer to Section 3.5.3 for information on allowable variances for other potential solutions, such as increasing the ramp slope to 1:12 maximum and reducing the landing depth to 3 feet minimum.

* Requires design approval.

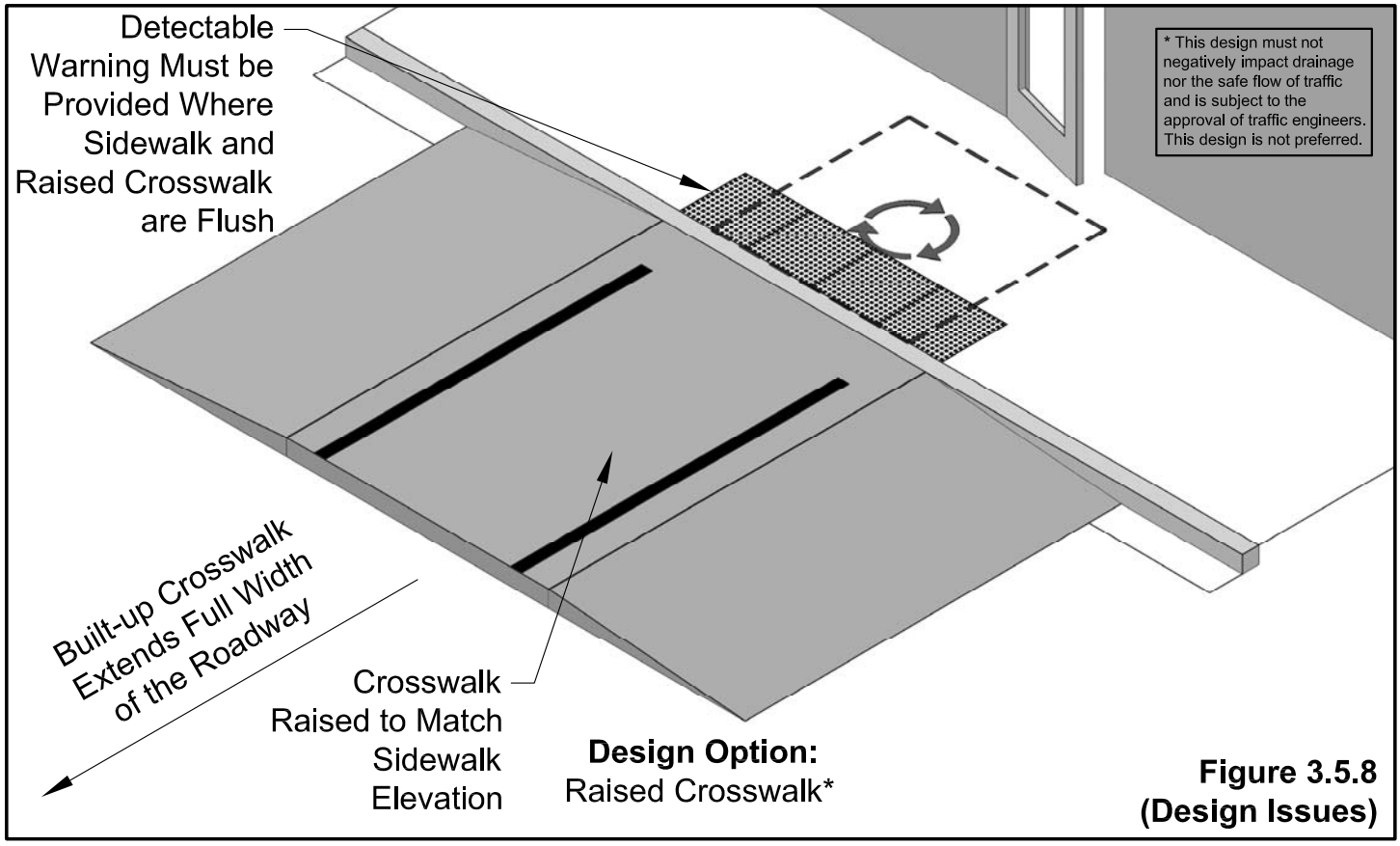


Design Issue:
Limited Right-of-Way (Cannot Apply the Preferred Perpendicular Ramp Design)

Figure 3.5.7 (Design Issues)

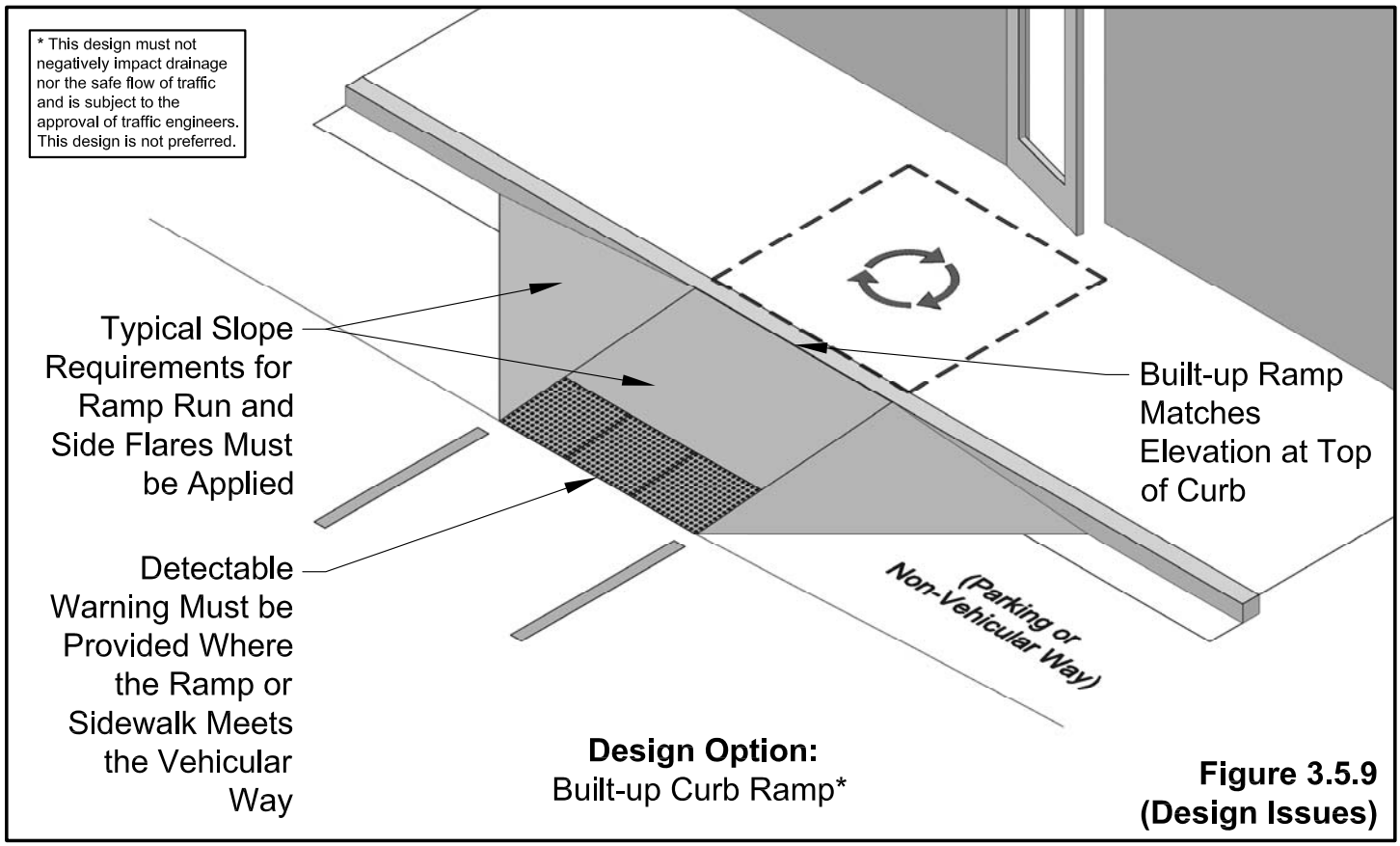
Note: Refer to Section 3.1 for typical curb ramp requirements.

3.5.2 Design Options (cont.)



Design Option:
Raised Crosswalk*

Figure 3.5.8 (Design Issues)



Design Option:
Built-up Curb Ramp*

Figure 3.5.9 (Design Issues)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.5.2 Design Options (cont.)

Design Issue:

3) Convergence of sidewalks with differing widths.

Description:

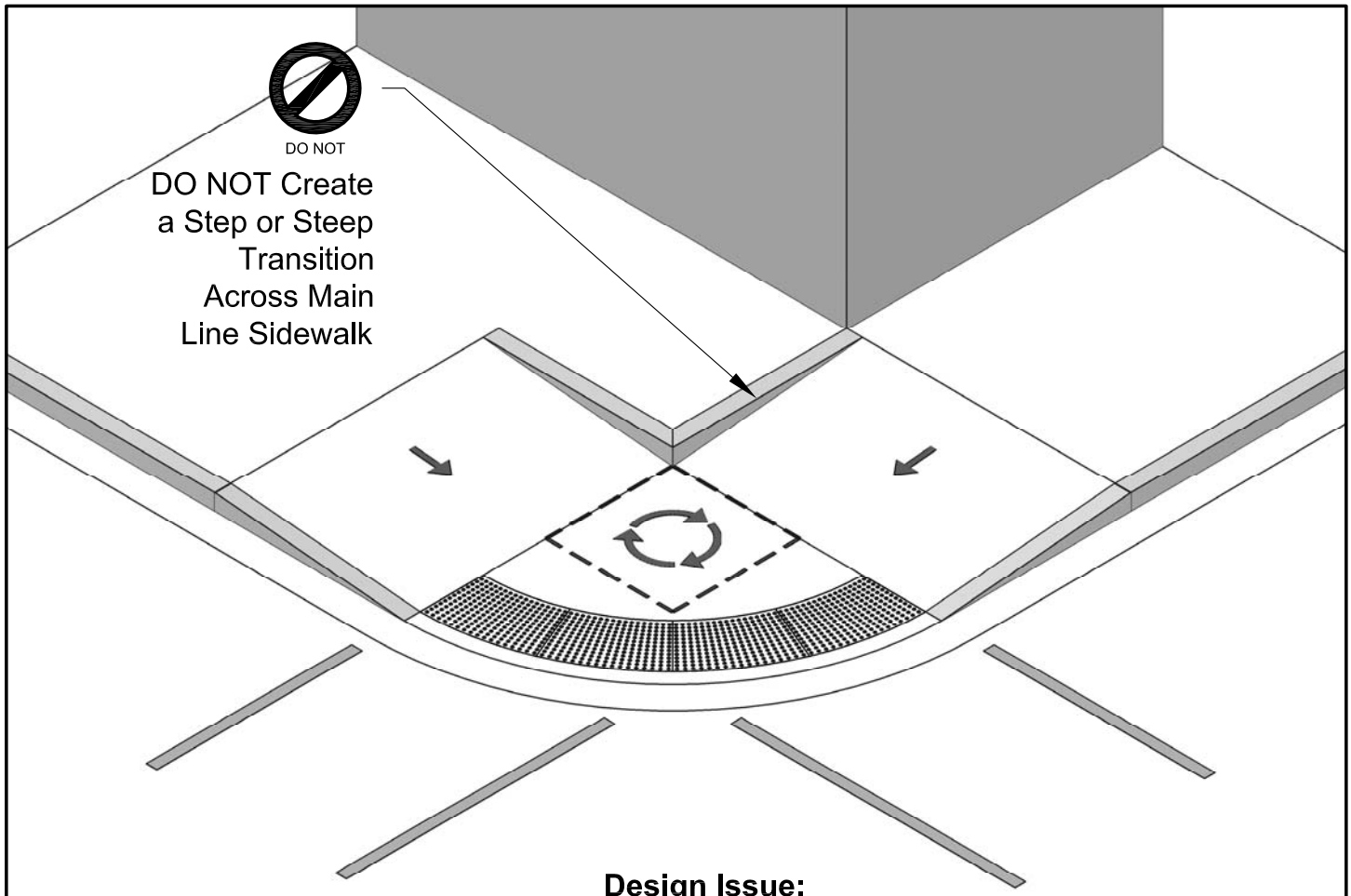
When two sidewalks of differing widths meet at a corner, it is important to avoid creating a step or a steeply transitioned main line sidewalk. The area of depressed curb should be kept to a minimum if a blended transition is used in order to limit the potential for confusion to the visually impaired person that may experience in attempt to locate the street crossing. The alignment of sidewalk, crosswalk, and curb ramp can be challenging with sidewalks of different widths. (Figure 3.5.10)

Design Option(s):

B) Reduce ramp widths to maximize ramp run. (Figure 3.5.11, next page)

H) Slightly offset the curb ramp location horizontally to accommodate the preferred perpendicular ramp design. (Figure 3.5.11, next page)

Note: It may be necessary to depress a larger area of curb in some cases. (Figure 3.5.12, next page)



Design Issue:
Convergence of Sidewalks with Differing Widths

Figure 3.5.10 (Design Issues)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.5.2 Design Options (cont.)

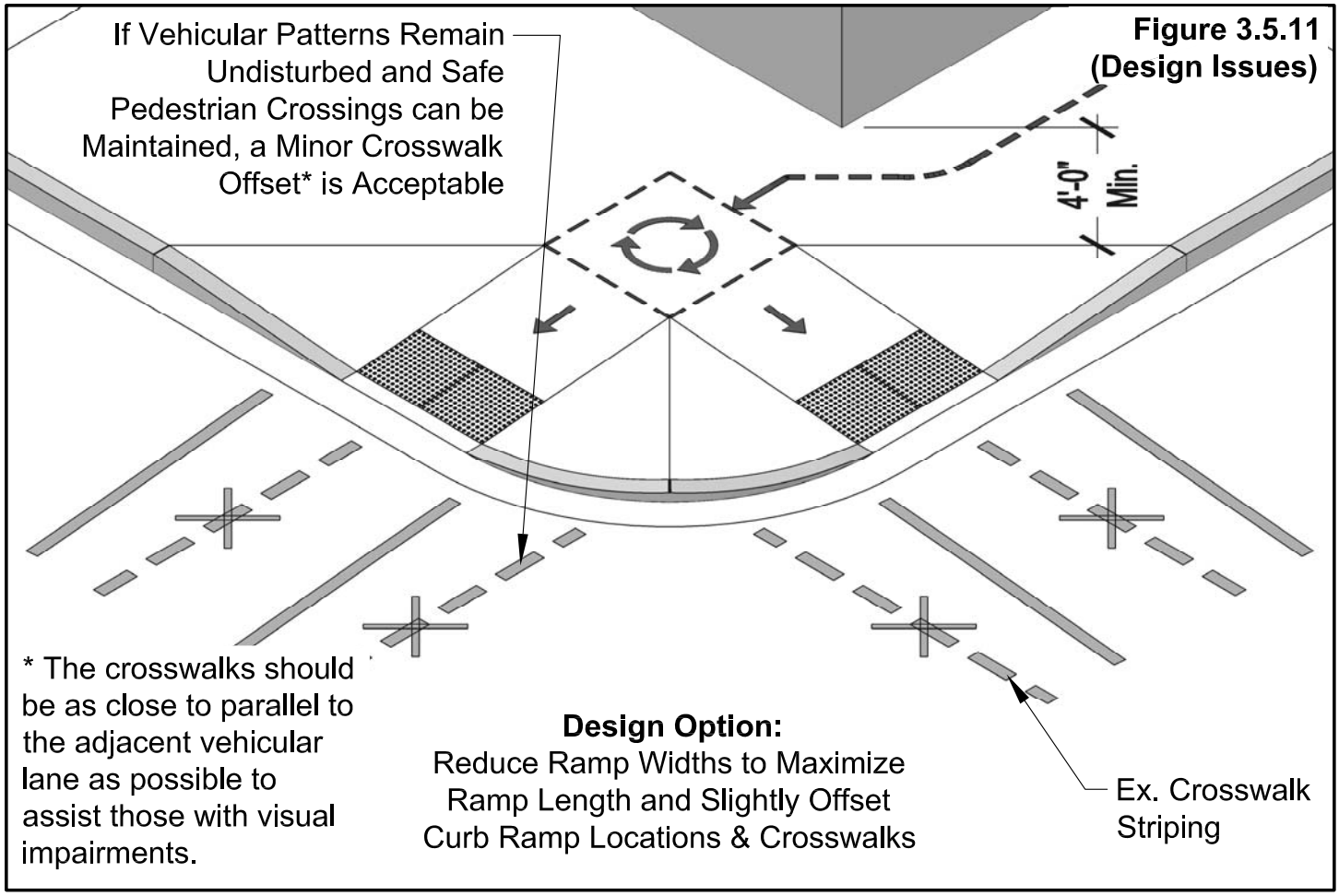


Figure 3.5.11 (Design Issues)

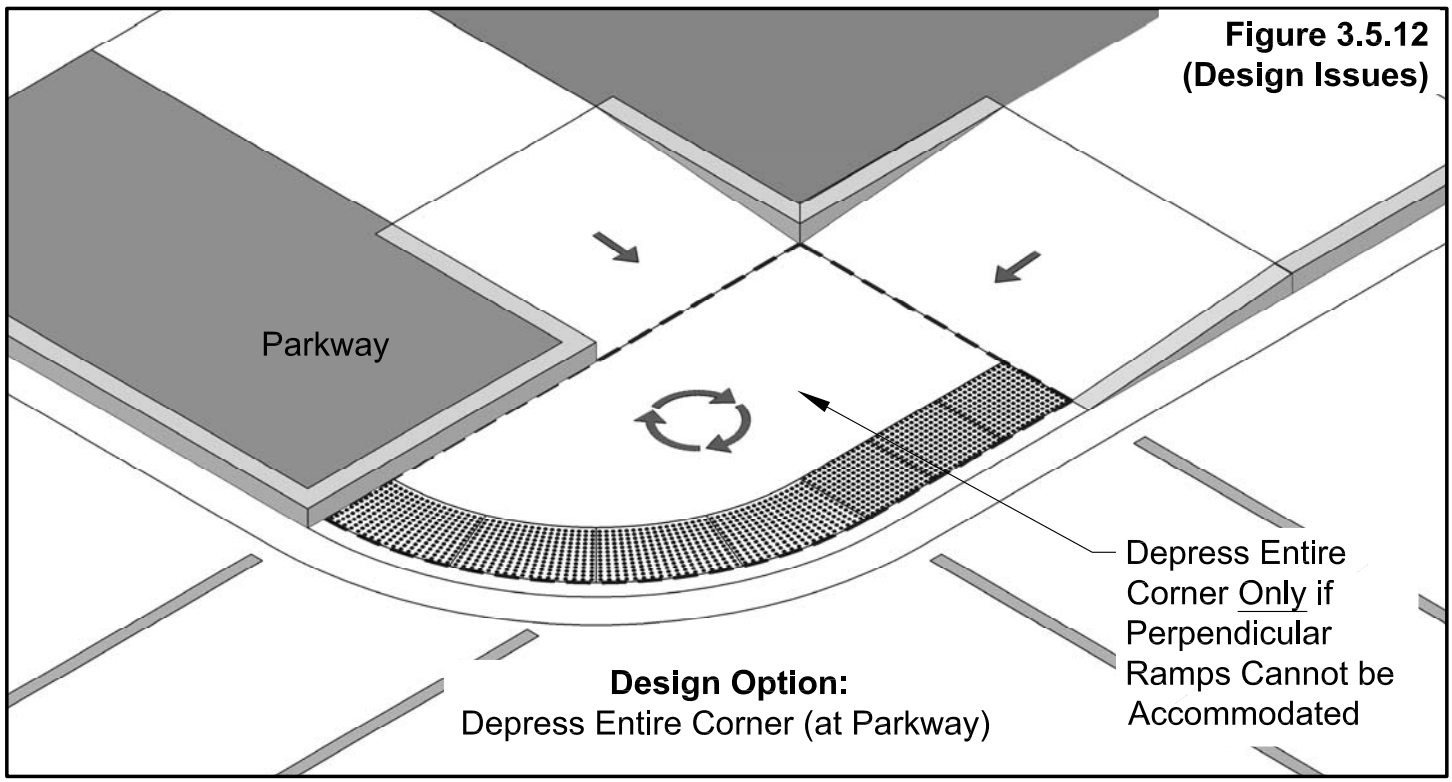


Figure 3.5.12 (Design Issues)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.5.2 Design Options (cont.)

Design Issue(s):

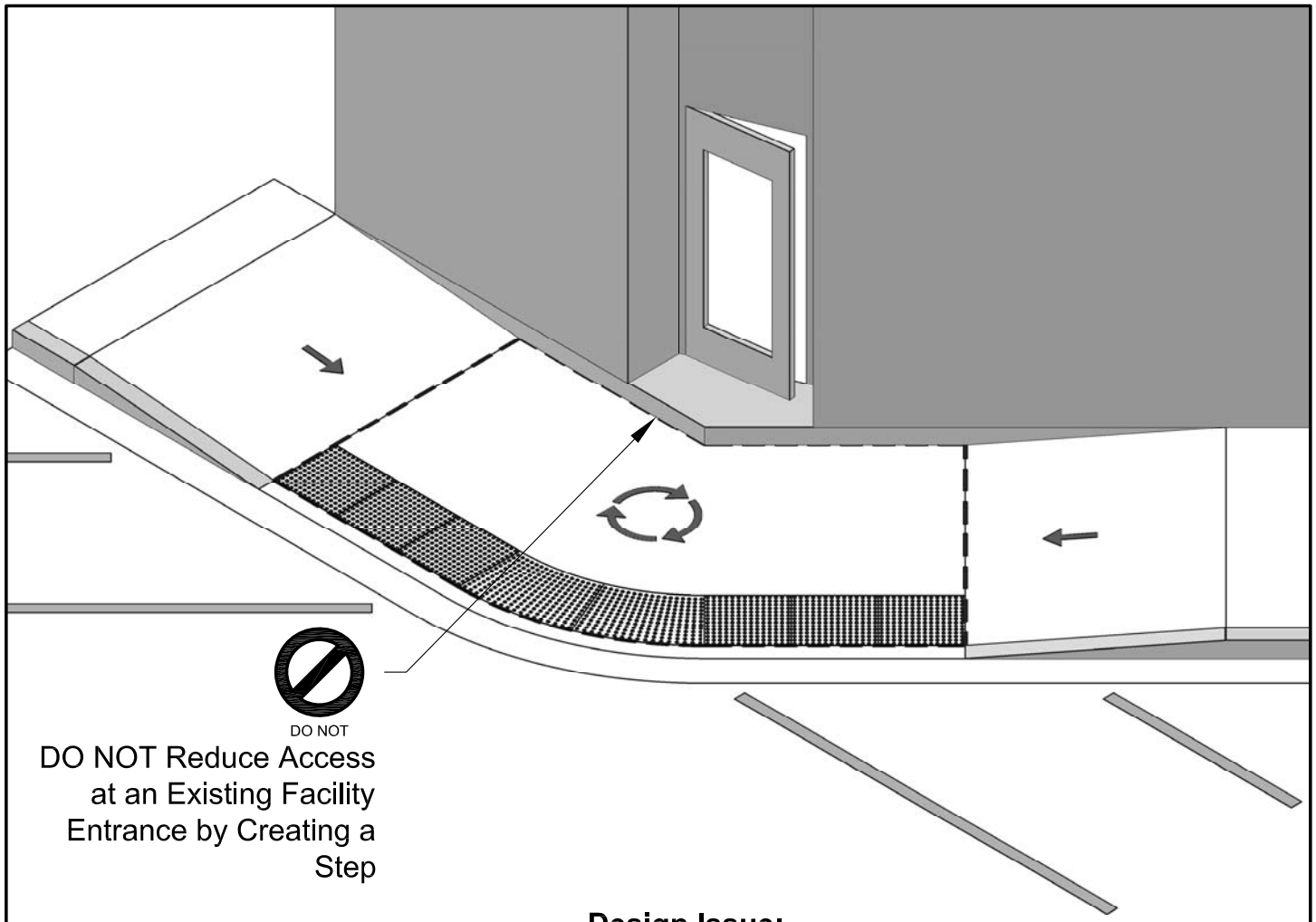
2) Limited available right-of-way
4) Large curb radius.

Description:

Because of the proximity of the existing curb to the face of building or property line, there is not enough available sidewalk area to install the preferred standard perpendicular ramp design. While the ramp itself may fit, the minimum ramp landing depth cannot be provided resulting in a non-compliant ramp design. The large curb radius further limits the list of available design options, and a parallel ramp design (blended transition) cannot be applied because access to the existing facility would be reduced. (Figure 3.5.13)

Design Option:

G) Provide diverging sidewalks with protected edges, allowing access to the existing facility and the sidewalk/street crossings. (Figure 3.5.14, next page)



Design Issue:
Large Curb Radius and Limited Available Right-of-Way

Figure 3.5.13 (Design Issues)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.5.2 Design Options (cont.)

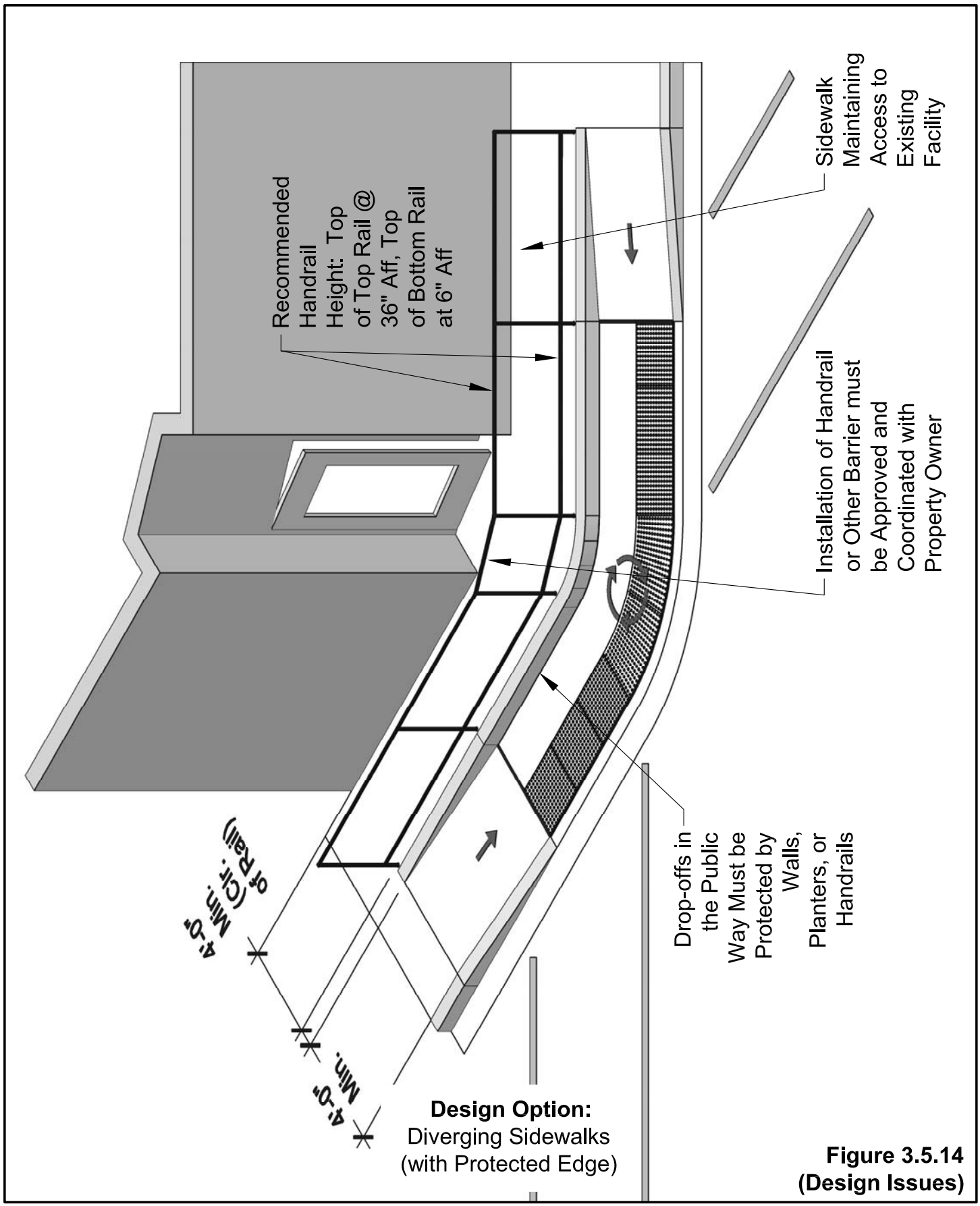


Figure 3.5.14 (Design Issues)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.5.2 Design Options (cont.)

Design Issue:

5) Utility structure in ramp cannot be adjusted or relocated.

Description:

An existing utility structure is located at an existing or at a proposed ramp location. The utility structure is positioned in a way that either hinders the ability to provide detectable warning for the full width of the ramp or cannot be adjusted which affects the slope of the ramp and/or creates a non-compliant level change on the ramp surface. (Figure 3.5.15)

Design Option(s):

B) Reduce ramp width to include the utility in the ramp side flare. (Figure 3.5.16, next page)

C) Reduce curb radius so the detectable warning can be provided for the full width of the ramp. (No Illustration Provided, Similar to Figure 3.5.5)

H) Slightly offset the curb ramp location horizontally to include the utility in the ramp side flare. (Figure 3.5.17, next page) If a grass parkway is provided, extend the parkway area to include the utility cover, removing it from the ramp surface area. (Figure 3.5.18, next page)

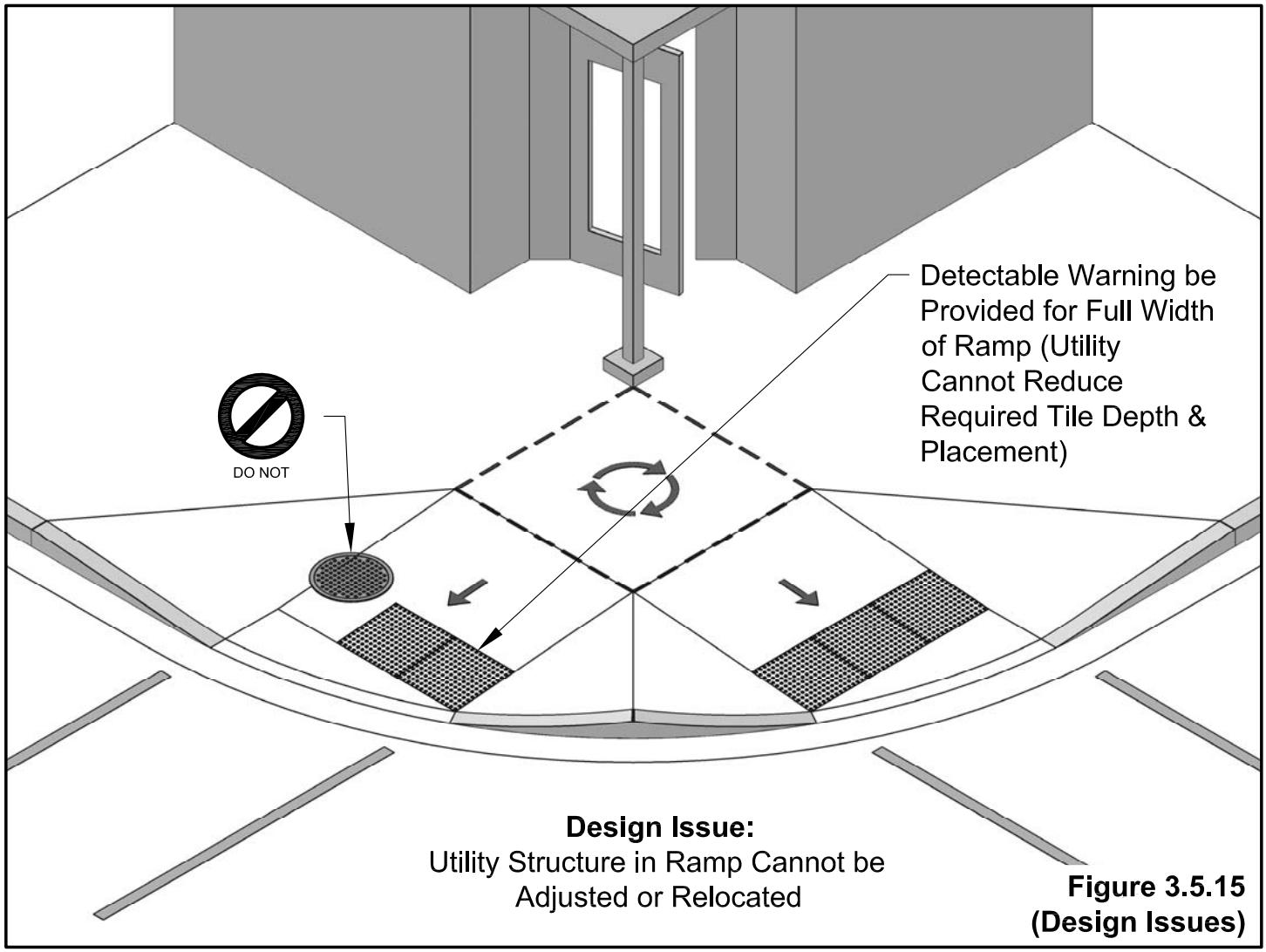


Figure 3.5.15 (Design Issues)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.5.2 Design Options (cont.)

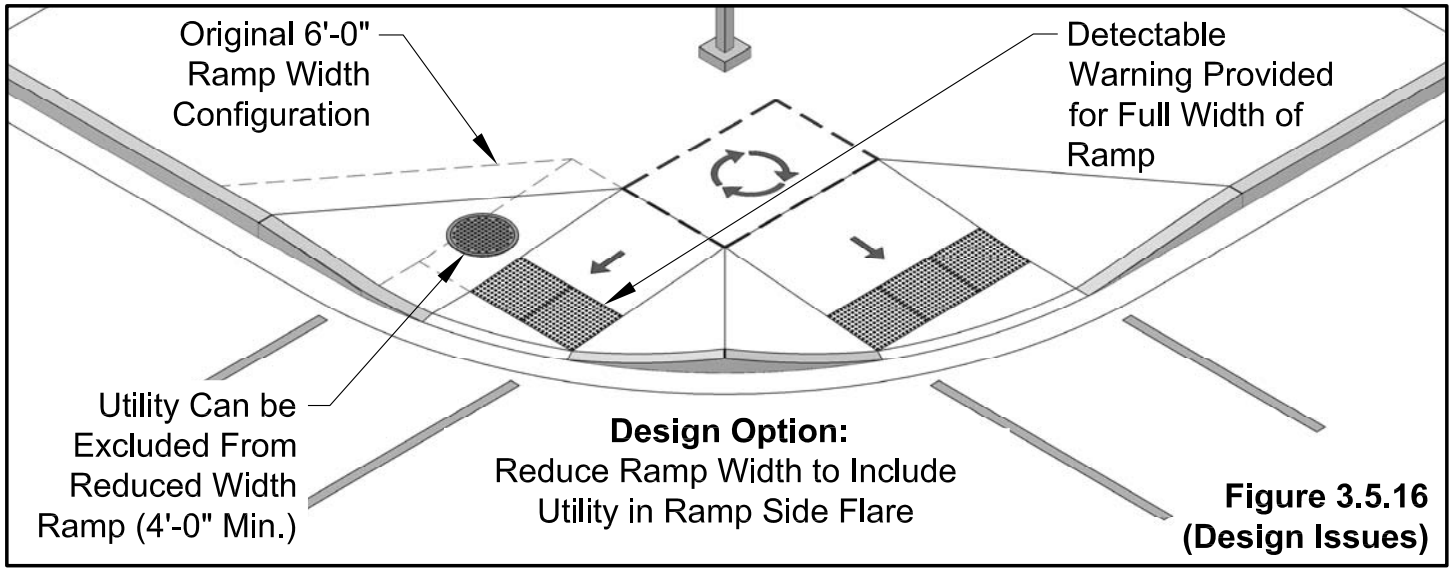


Figure 3.5.16 (Design Issues)

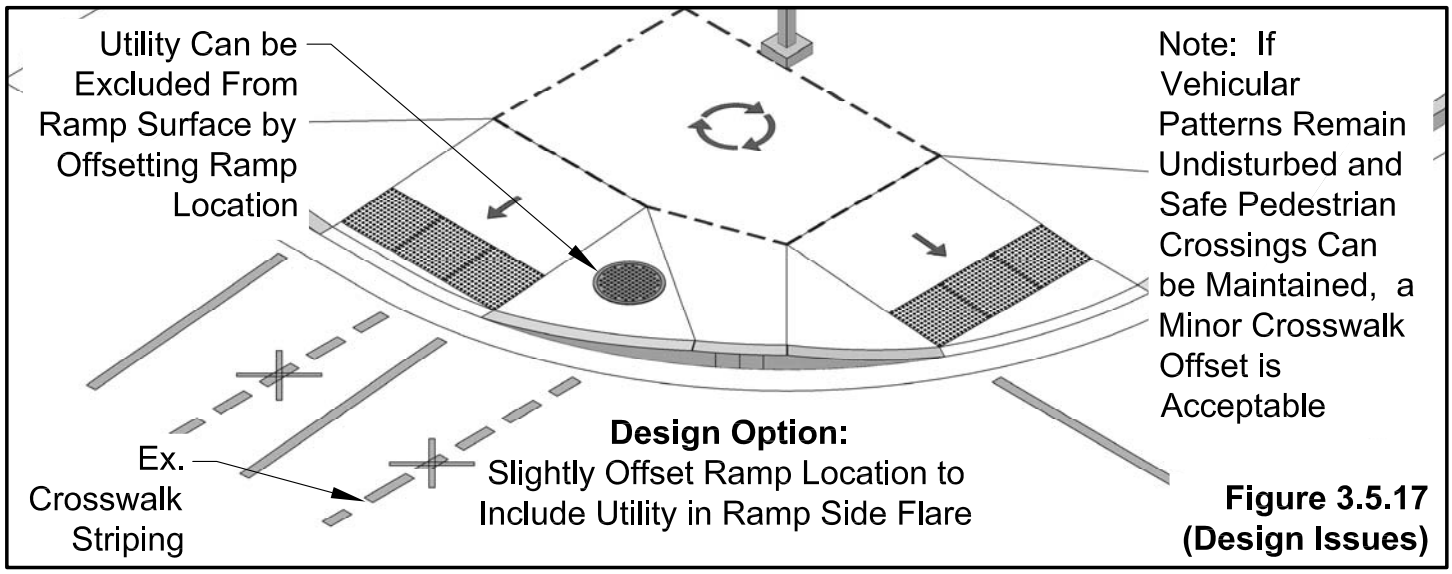


Figure 3.5.17 (Design Issues)

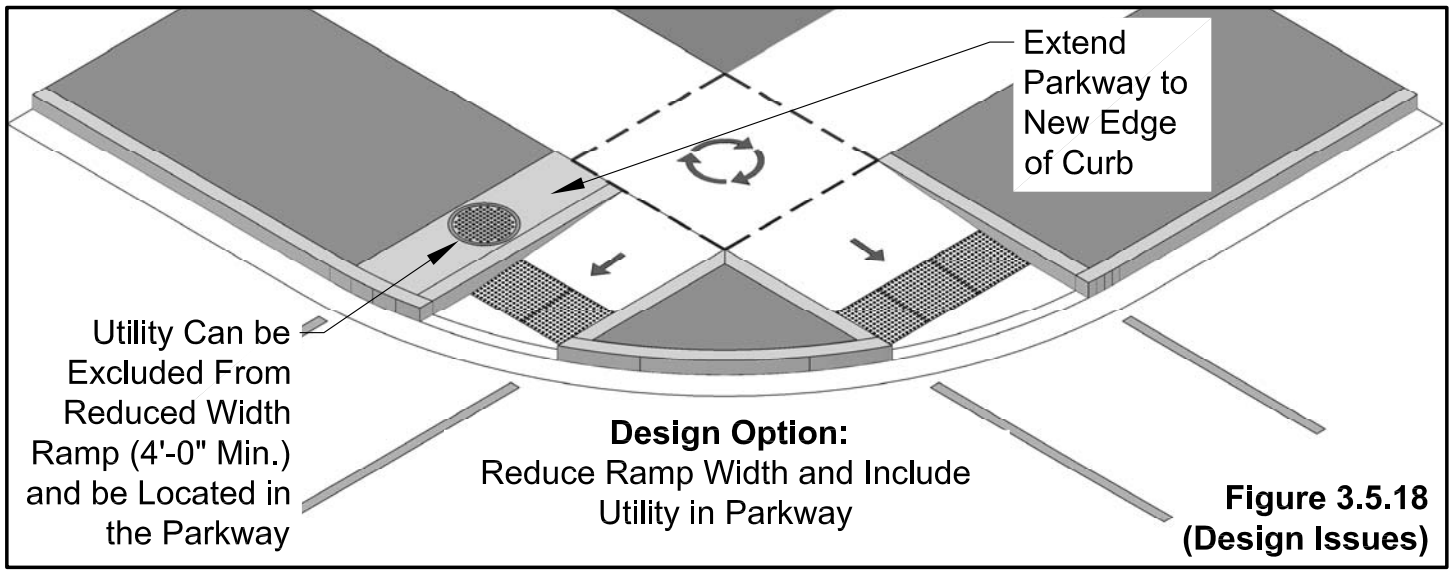


Figure 3.5.18 (Design Issues)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.5.2 Design Options (cont.)

Design Issue:

6) Ramp located at the base of an existing bridge.

Description:

An existing bridge can make compliant curb construction difficult with fixed points at the bridge and the existing roadway. The ability to perform structural changes to the bridge to create compliant slopes is typically not feasible. (Figure 3.5.19)

Design Option(s):

- Provide a ramp with the minimum running slope possible. (Figure 3.5.19) If the ramp must exceed the federal maximum allowable running slope of 8.33% to connect the fixed points, approval must be granted.
- Maintain the highest level of accessibility throughout the remainder of the intersection, allowing pedestrians to chose an alternate route if necessary.
- Slightly raise the pavement to make the base of the proposed curb ramp and the existing street meet. (No Illustration Provided, Similar to Figure 3.5.2)

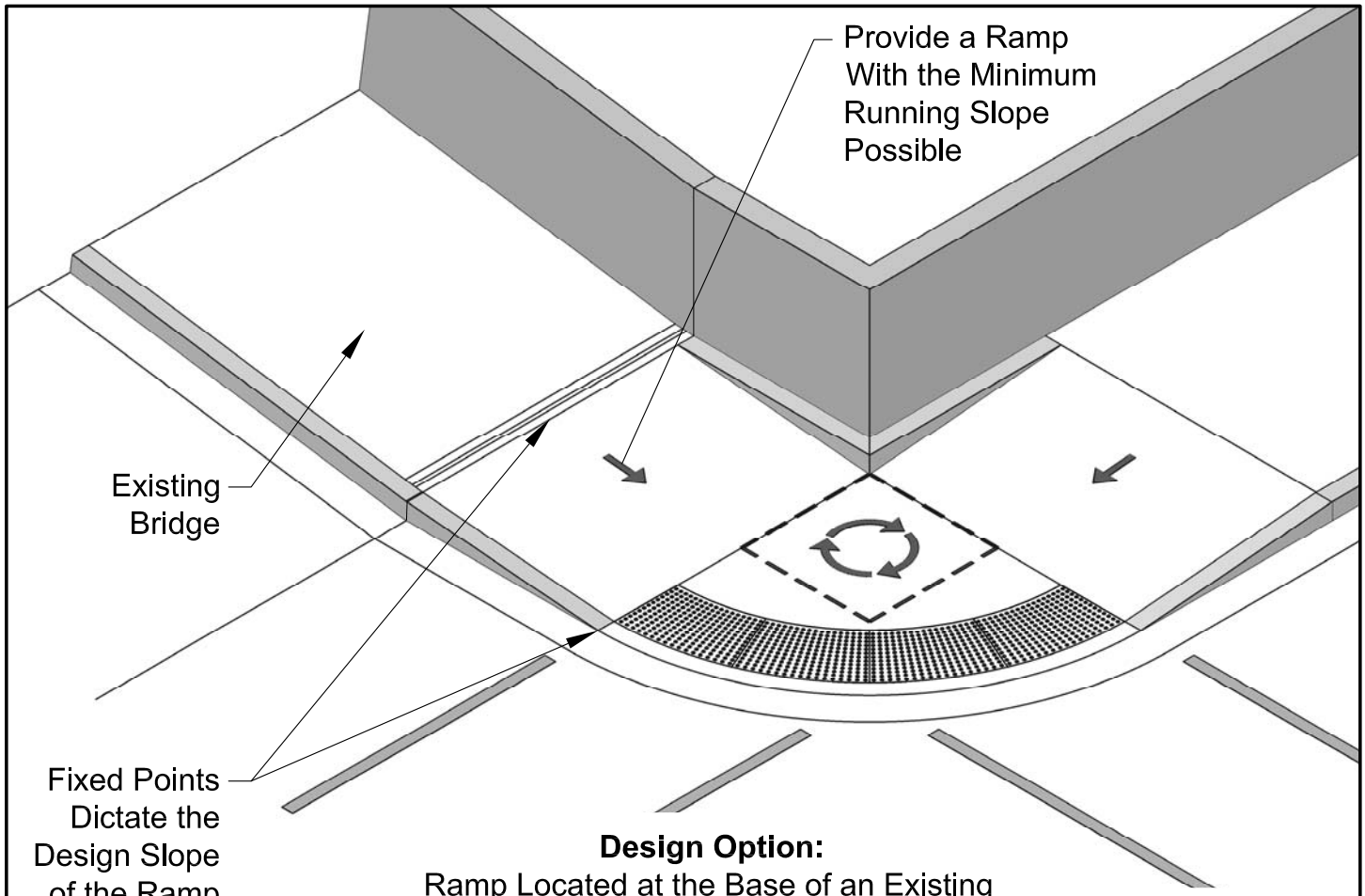


Figure 3.5.19 (Design Issues)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.5.2 Design Options (cont.)

Design Issue:

7) Doorway located at alley or driveway crossing.

Description:

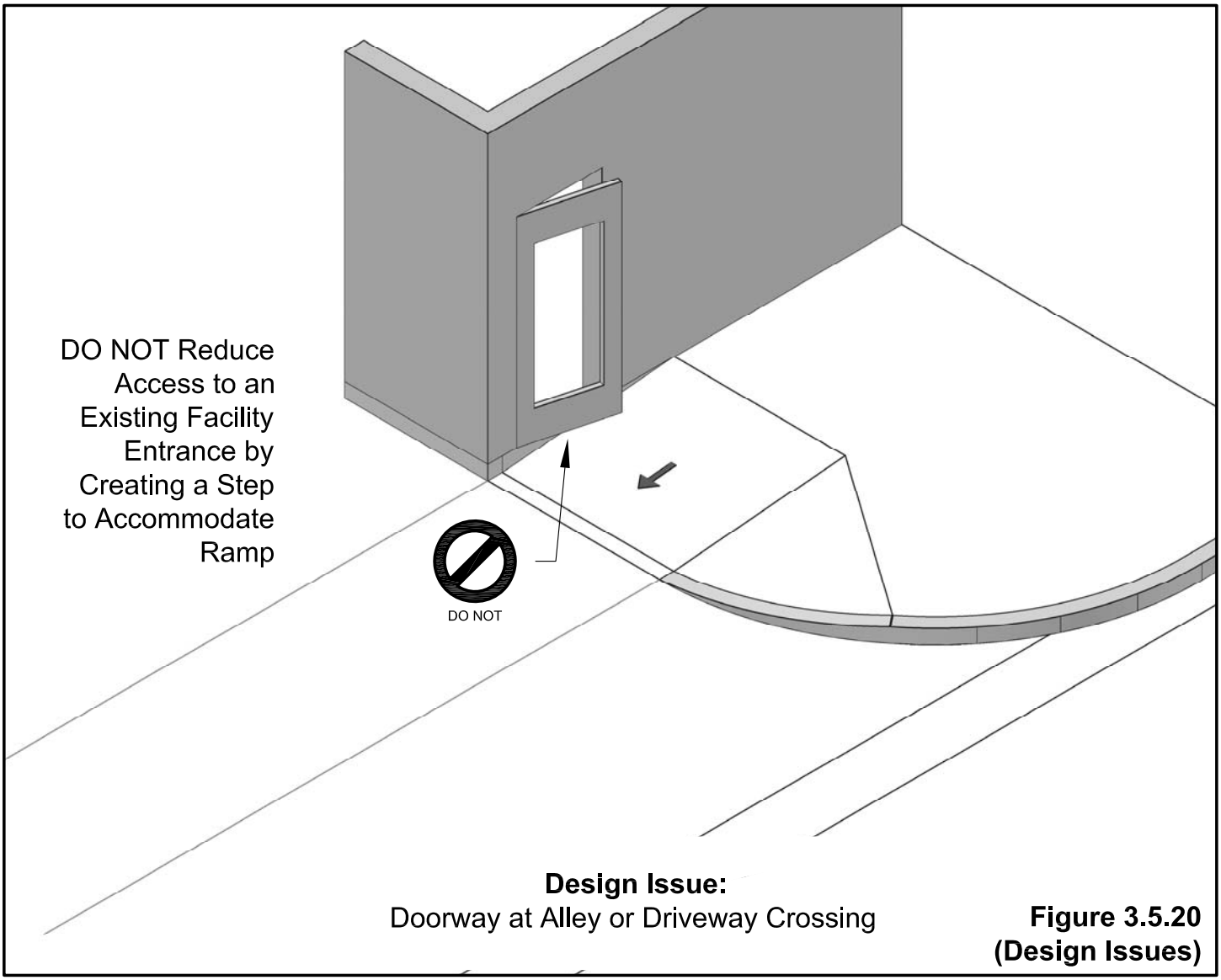
A ramp placed at the typical location for an alley or driveway crossing creates a step reducing access to an existing facility. (Figure 3.5.20)

Design Option(s):

G) Provide diverging sidewalks with protected edges, allowing access to the existing facility and the alley/driveway crossing. (Figure 3.5.21, next page)

H) Offset the curb ramp location horizontally to the curb line while maintaining a compliant alley/driveway crossing (Refer to Section 6.0 for Additional Information). (Figure 3.5.22, next page)

E) Raise the alley or driveway crossing to the elevation of the sidewalk. (No Illustration, Similar to Figure 3.5.8)



Design Issue:
Doorway at Alley or Driveway Crossing

Figure 3.5.20 (Design Issues)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.5.2 Design Options (cont.)

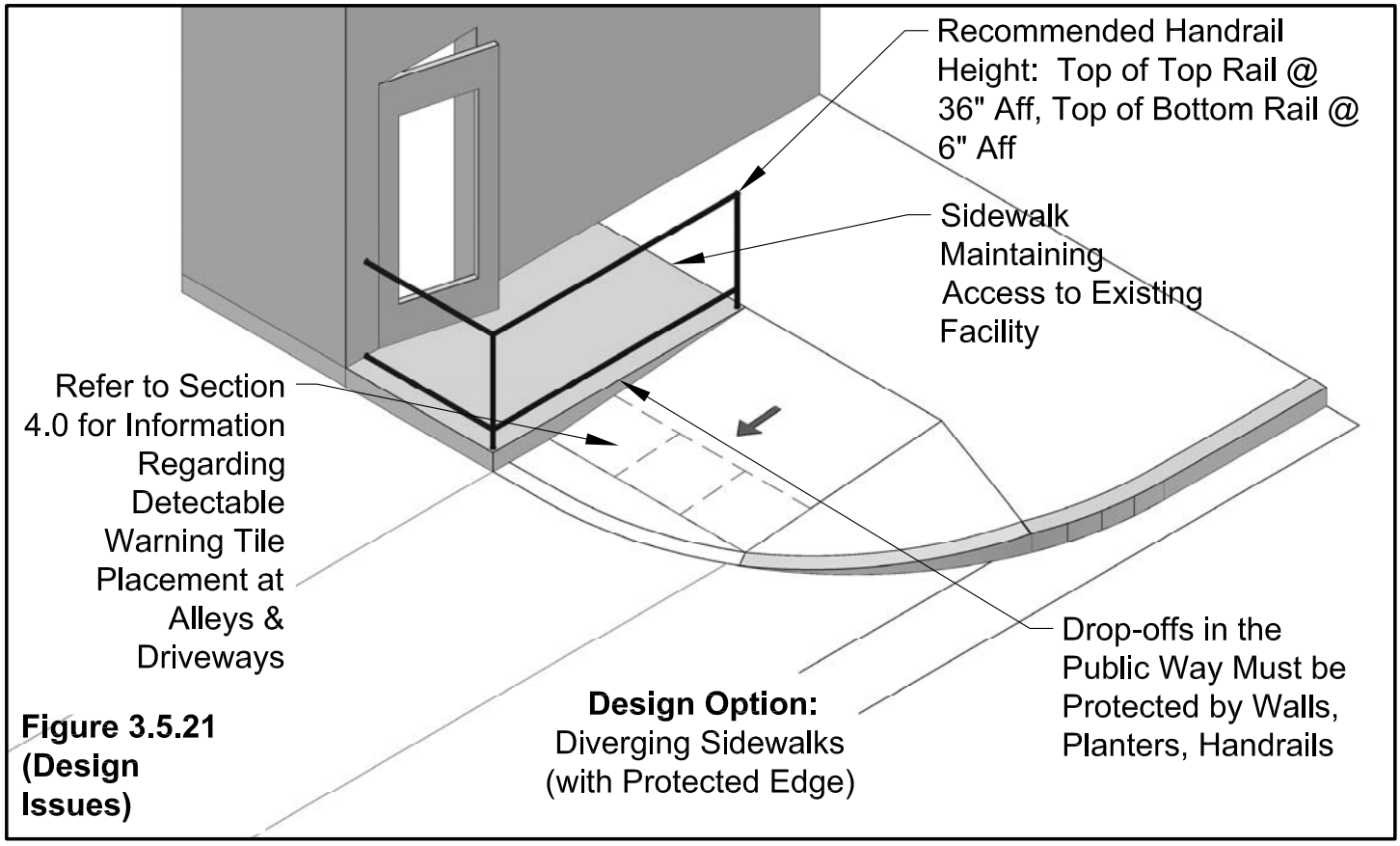


Figure 3.5.21 (Design Issues)

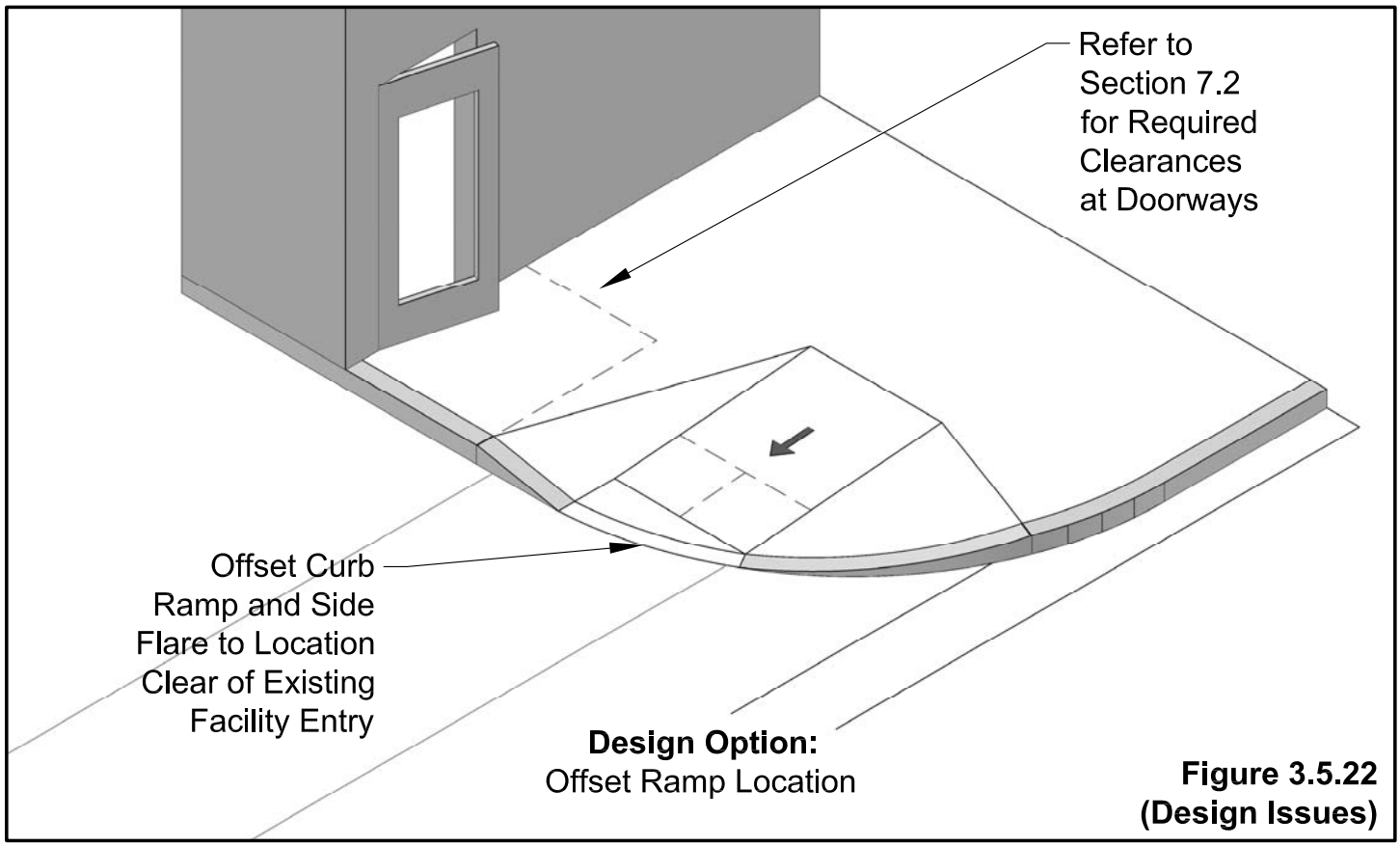


Figure 3.5.22 (Design Issues)

Note: Refer to Section 3.1 for typical curb ramp requirements.

3.5 Curb Ramps - Design Issues (cont.)

3.5.3 Allowable Design Variances

The goal for curb ramp design is to provide accessible, ADA compliant ramps while minimizing impact to existing conditions. The ramps and landing areas should be designed and installed to avoid moving utilities (manholes, poles, hydrants, catch basins, etc.) if possible. Accessibility to existing facilities, including doorways and/or other entries, must not be reduced by creating a step or other barrier where one does not currently exist. Curb ramp designs should compliment the mainline sidewalk and crosswalk being served. Ideally, the curb ramp is in alignment with the mainline sidewalk and the crosswalk and the ramp level landing area is positioned at the intersection of mainline sidewalks. Existing vehicular traffic patterns must not be affected by any modified crosswalk location.

Curb ramp designs should be implemented in the following order of precedence:

1. Two perpendicular ramps (with one ramp serving each crosswalk).
2. Blended transition.
3. Diagonal curb ramp.

The following variances may be considered only **when necessary in order to achieve the most preferred design** without special approval:

- Ramp Width: May be reduced from 6 feet to a 4 foot minimum.* This could allow for 2 feet of additional ramp run at intersections to compensate for an elevation difference as well as minimize the area required for ramps at tight corners.
- Ramp Running Slope: May be increased from 1:14 to a 1:12 maximum. Increased ramp slope may compensate for an elevation difference. (Refer to Section 3.1.4 for slope allowances for ramps with limited vertical rise)
- Ramp Side Flare Slope: May be increased from 1:12 to a 1:10 maximum. This may be necessary at tight corners to accommodate side flares. Sides of ramps may be returned only where cross travel is prohibited by landscaping, street furniture, poles, or equipment.
- Ramp Landing Depth: May be decreased from 4 feet to a 3 foot minimum. This may be required at tight corners. The ramp landing must always match the width of the ramp.
- Cross Slope: May be increased from 1:64 to a 1:48 maximum. This variance can be applied if required at any location (ramp, landing, or sidewalk).
- Pedestrian Access Route Width: May be reduced from 6 feet to a 4 foot minimum. The pedestrian access route may be a portion of the overall sidewalk width and must meet the standard slope requirements for the minimum width of 4 feet. Refer to Section 2.1 for additional information.

* The minimum ramp width the public way is 4 feet; the federal minimum curb ramp width (ADAAG) is 3 feet.

4.0 Detectable Warning

4.1 Detectable Warning - Overview

The detectable warning surface is not a widely understood concept. Construction professionals and the general public alike are at times confused with the true purpose of the detectable warning surface. For example, truncated domes are not designed for traction underfoot as some may believe. The primary purpose of this detectable warning surface is to alert the blind and visually impaired that they are approaching a potentially hazardous area. It is important to understand that the blind and visually impaired typically rely on a number of different cues when negotiating the public way including but not limited to the sound of surging traffic, grade changes on sidewalks and the detectable warning surface recognized underfoot or by the use of a long white cane.

In the public way, a standard curb also helps the blind and visually impaired identify the bounds of the sidewalk adjacent to the vehicular or otherwise hazardous way. Because access is also important to wheelchair users and other pedestrians, curb ramps are provided. The detectable warning surface sends a final alert to pedestrians that they have approached the base of a curb ramp and the edge of the vehicular travel lane. Upon reaching this warning point, the pedestrian is given the opportunity to establish orientation if making a street crossing.

The use of a detectable warning must be limited to street intersections, transit platforms and other clearly hazardous ways. Overuse of the detectable warning at locations such as alley crossings or non-signalized driveways can send confusing information to the blind. A blind pedestrian may stop at an alley crossing with detectable warning anticipating a safe crossing, indicated by the sound of a surge in traffic that may not come.

A good design aligns the curb ramp, detectable warning and the crosswalk in a way that provides information clearly for the safest street crossing possible. It is important to consistently apply the detectable warning in the public way, making sure the information provided to the blind and visually impaired easy to understand.

The truncated dome surface of the detectable warning should be aligned perpendicular to the path of travel, providing information to the blind to assist with orientation while allowing a wheelchair to roll over the textured and slip-resistant surface. The surface color is in contrast to the adjacent sidewalk, supplying pedestrians with low vision with additional information. The detectable warning may also provide an auditory cue when a cane hits the surface of the surface, resonating a sound different from that heard when traveling on a typical concrete sidewalk. All of the elements of the detectable warning surface have been developed to provide information to the blind and visually impaired while minimizing any disruption to the general use of the public way.

4.2 Detectable Warning - General Requirements

4.2.1 Physical Requirements

The following summary of requirements are the current federal minimum and/or maximum dimensions or conditions for detectable warning surfaces (per ADAAG & PROWAG). The detectable warning supplier or manufacturer is responsible for adhering to these requirements.

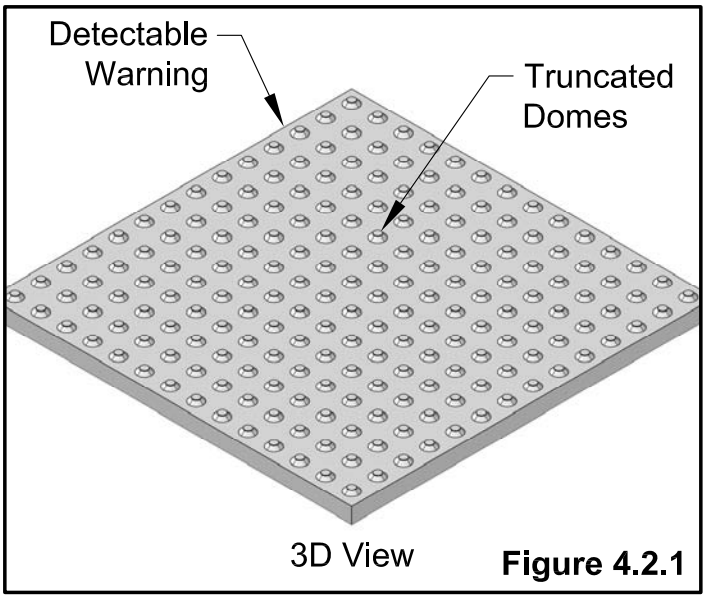


Figure 4.2.1

Dimensions

- Truncated Dome Base Diameter Size (Per PROWAG): Ranging Between 0.9" Minimum and 1.4" Maximum. (Figure 4.2.2)
- Truncated Dome Top Diameter Size (Per PROWAG): Ranging Between 50% Minimum and 65% Maximum of the Base Diameter Size. (Figure 4.2.2)
- Truncated Dome Height (Per PROWAG): 0.2". (Figure 4.2.3)
- Truncated Dome Spacing (Per PROWAG): Center-to-Center Spacing of 1.6" Minimum and 2.4" Maximum, and a Base-to-Base Spacing of 0.65" Minimum (Measured Between the Most Adjacent Domes). (Figure 4.2.3)

Note: Where radial tiles must be used, the dome-to-dome spacing may differ from the specified range.

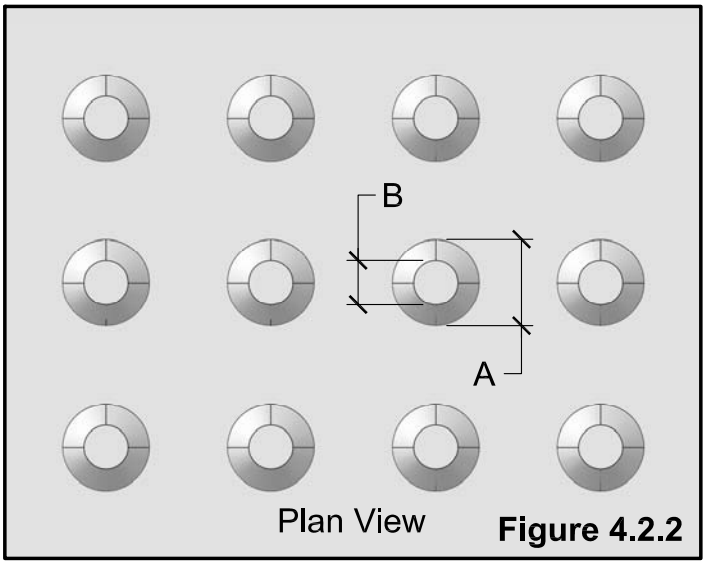


Figure 4.2.2

A (Base Diameter) - 0.9" Min. to 1.4" Max.
B (Top Diameter) - 50%-65% of Base Dia.
C (Dome Height) - 0.2"
D (Center-to-Center) - 1.6" Min. to 2.4" Max.
E (Base-to-Base) - 0.65" Min.

Contrast

Dectectable Warning Surfaces Shall Contrast Visually With Adjacent Gutter, Street or Highway Surfaces, Either Light-on-Dark or Dark-on-Light (Per PROWAG).

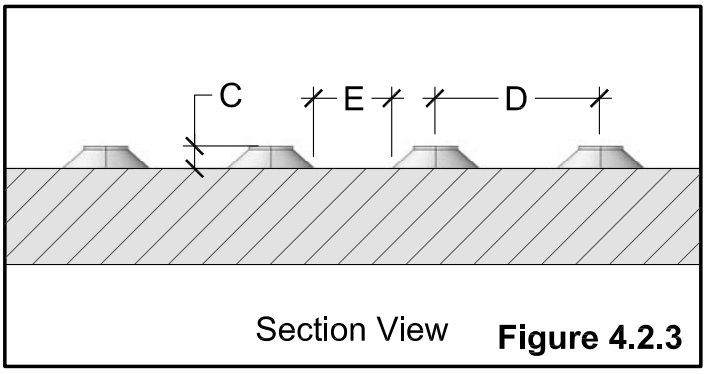


Figure 4.2.3

4.2 Detectable Warning - General Requirements

4.2.2 Placement Requirements

Depth

- The detectable warning surface must be provided for a minimum depth of 24" in the direction of travel. This depth cannot be reduced or obstructed in any way by existing utilities and/or barriers. The rows of domes on the detectable warning tile must be positioned perpendicular to the path of travel, unless radial tiles must be used or at curb ramps with a large setback from back-of-curb to bottom of ramp (Refer to Figure 4.3.9, Page 84). (Figure 4.2.4)

Width

- The detectable warning surface must be provided for the full width of the ramp (side flares excluded) or any portion of the sidewalk that is flush with the elevation of the adjacent roadway or pertinent hazardous area.

Note: Where prefabricated detectable warning tiles or panels are used, the cutting of tiles should generally be avoided if possible, but may be an option if the only available design necessitates this action. The tile vendor or manufacturer may need to be consulted to confirm this option as well as to provide instruction to properly secure or anchor a cut tile to the walking surface.

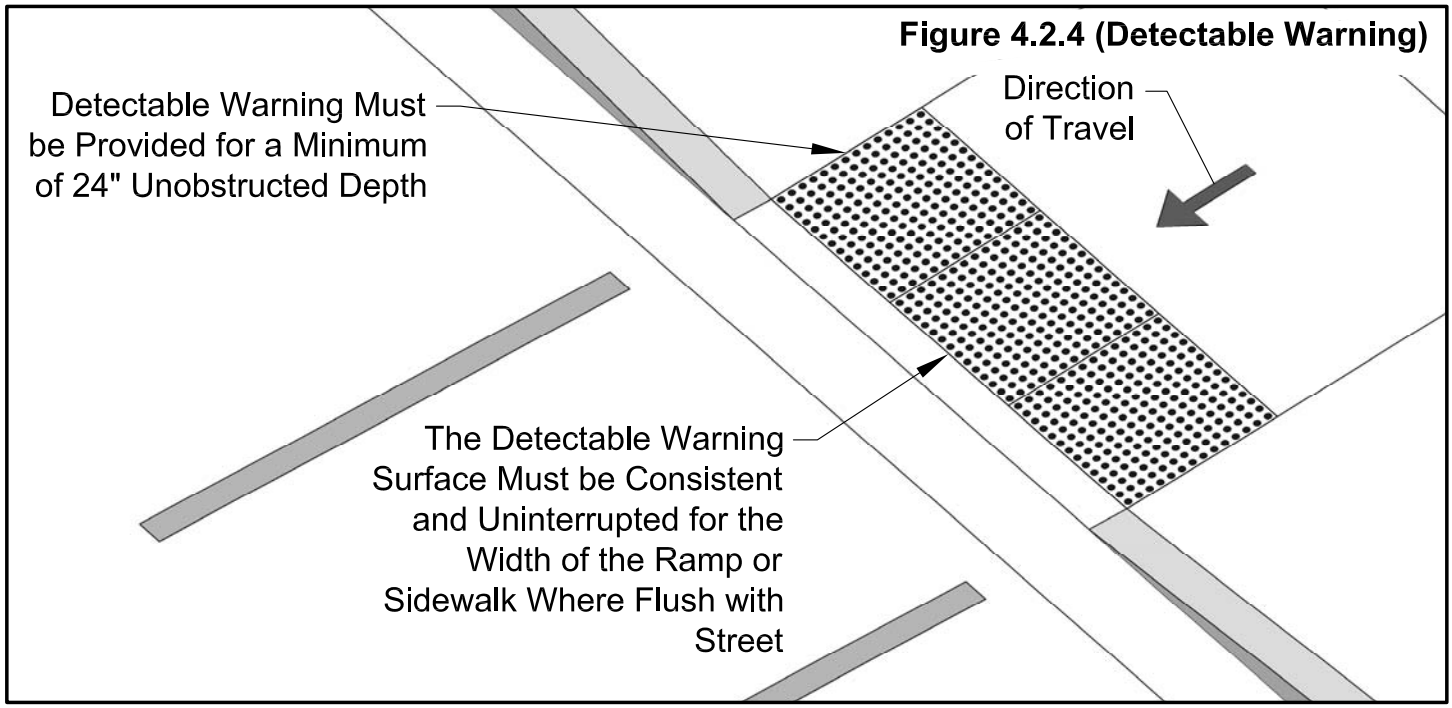


Figure 4.2.4 (Detectable Warning)

4.2.3 Approved Products & Methods

The surface of the detectable warning must endure stresses in a harsh climatological environment. Extreme temperature changes (freeze/thaw cycles), traffic driving over the ramps, and the blades of snowplows are all examples of some of the elements that can cause the truncated domes of the detectable warning to shear off, the surface to crack or break, and anchoring pins can become loose or fall out (where applicable). Only approved products and methods of installation can be used in the public way within the City limits.

The pursuit of alternate products and installation methods for different types of detectable warning to assure the best options are available for construction of curb ramps and sidewalks is an ongoing process.

4.3 Detectable Warning - Required Locations & Alignment

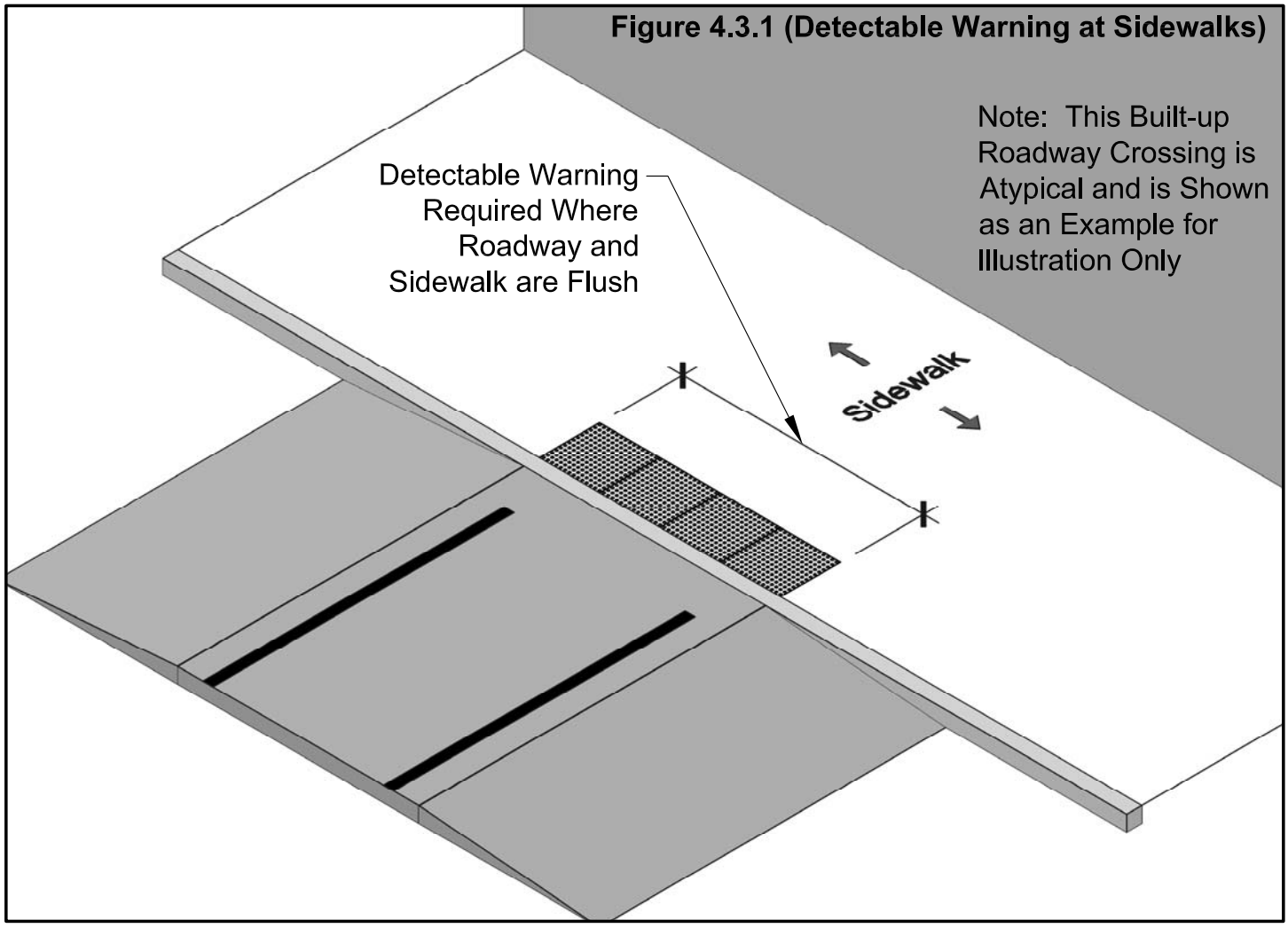
4.3.1 Sidewalks

In the public way, any location where the sidewalk is flush with the adjacent roadway must include detectable warning at the back-of-curb to alert the blind and visually impaired. **This includes any portion of the pedestrian circulation path flush with the vehicular way, regardless of the pedestrian crossing location or lack thereof.** Typically the locations where the sidewalk and street are flush should be limited to the areas deemed safe for pedestrian crossings.

Similarly, at times the elevation of the street may actually rise up at the intersection and meet the elevation at the sidewalks for a **flush transition**. Although it may not be necessary to ramp the sidewalk down to meet the street, again it is required that the detectable warning be provided where the two surfaces are flush. (Figure 4.3.1) Where the sidewalk is situated about a radius, the domes of the detectable warning will be located radially and not truly perpendicular to the path of travel. (Figure 4.3.2, next page)

If a street crossing is provided only in one direction at an intersection where the street level is raised up to the sidewalk, it is important to carefully design the tile location to provide the best information possible to the visually impaired. The depressed curb area should be limited only to the available street crossing with the detectable warning located at the back-of-curb. (Figures 4.3.3, 4.3.4, next page)

Figure 4.3.1 (Detectable Warning at Sidewalks)



4.3.1 Sidewalks (cont.)

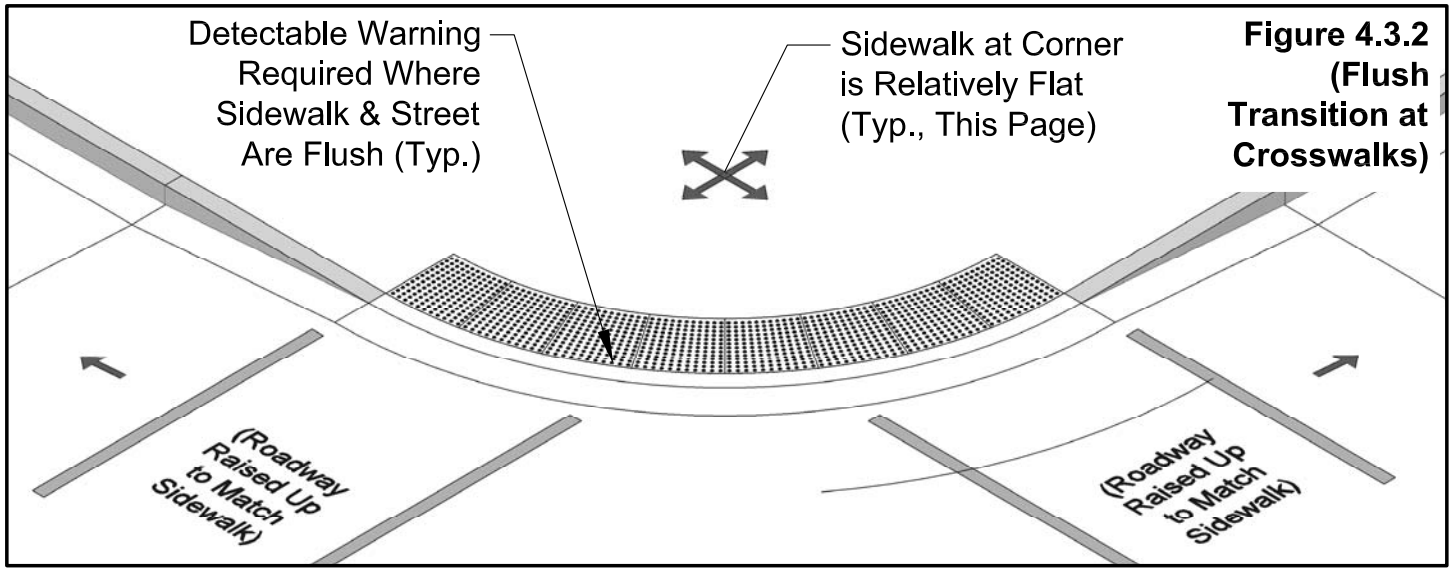


Figure 4.3.2 (Flush Transition at Crosswalks)

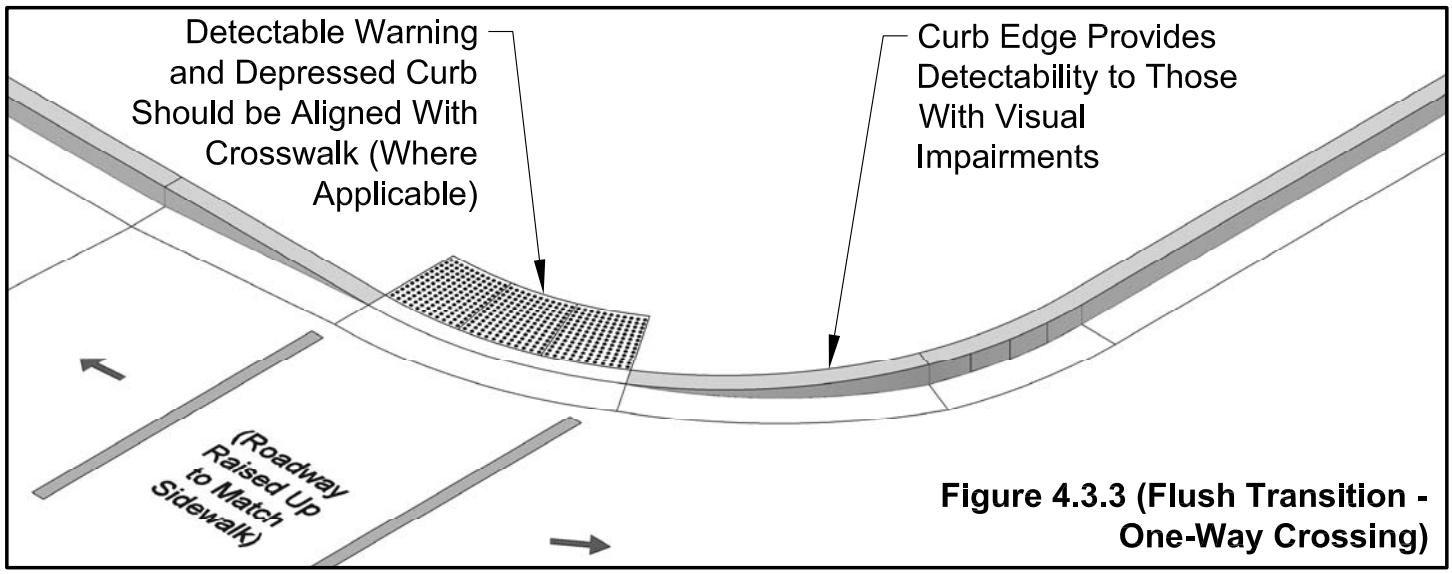


Figure 4.3.3 (Flush Transition - One-Way Crossing)

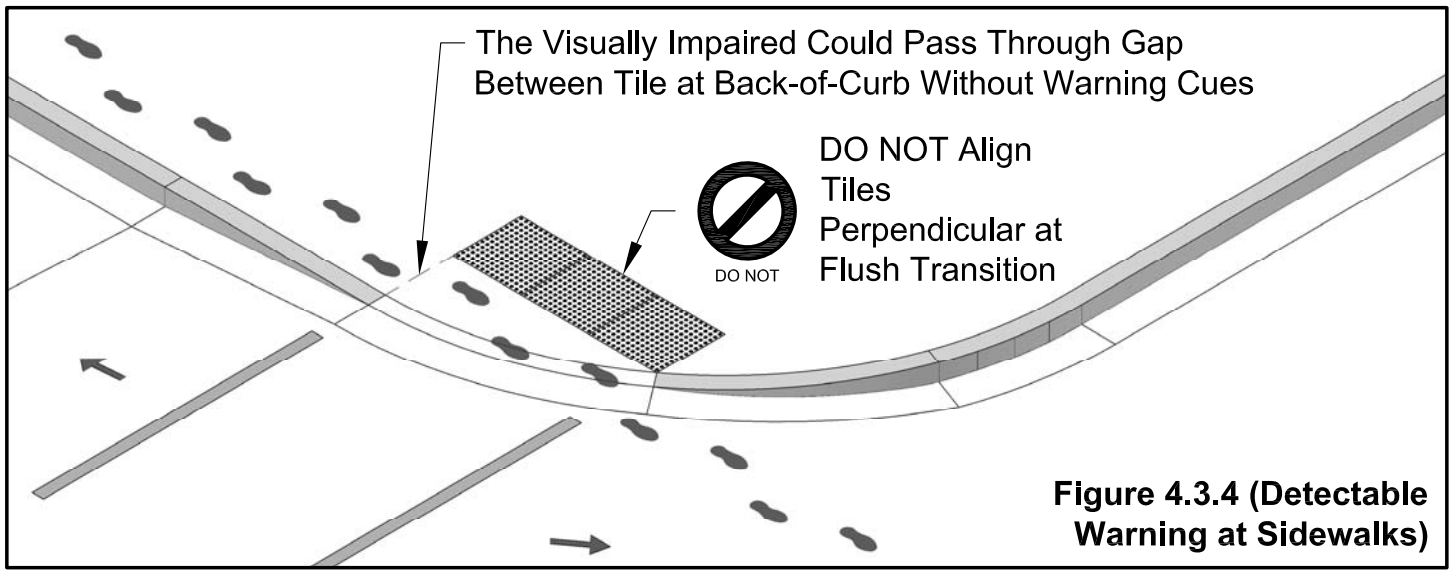


Figure 4.3.4 (Detectable Warning at Sidewalks)

4.3.2 Curb Ramps

Where curb ramps are installed at a street crossing, a detectable warning must be provided at the base of the curb ramp as an alert to the blind and visually impaired. The detectable warning surface must be provided for the full width of the ramp at a minimum unobstructed depth of 24 inches. The domes of the detectable warning surface should be aligned perpendicular to the path of travel in order to assist the visually impaired with orientation and ease of wheelchair use. (Figure 4.3.5)

In addition to the detectable warning surface, the preferred perpendicular curb ramp, when designed and built in a consistent way, provides other cues to the visually impaired. Because the ramp and side flare slopes assist in locating the top of the ramp, the detectable warning should still be located perpendicular to the path. (Figure 4.3.6)

It is important to recognize the **driveway ramps are not considered part of the pedestrian way**, and therefore do not require detectable warning.

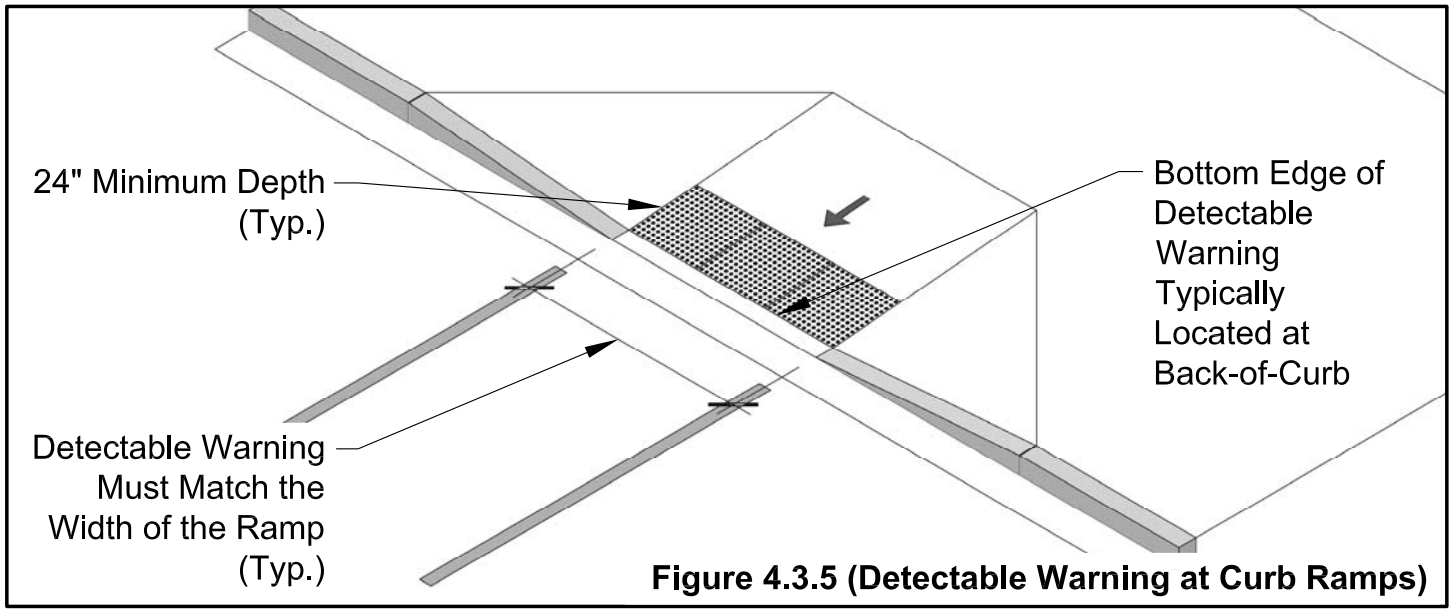
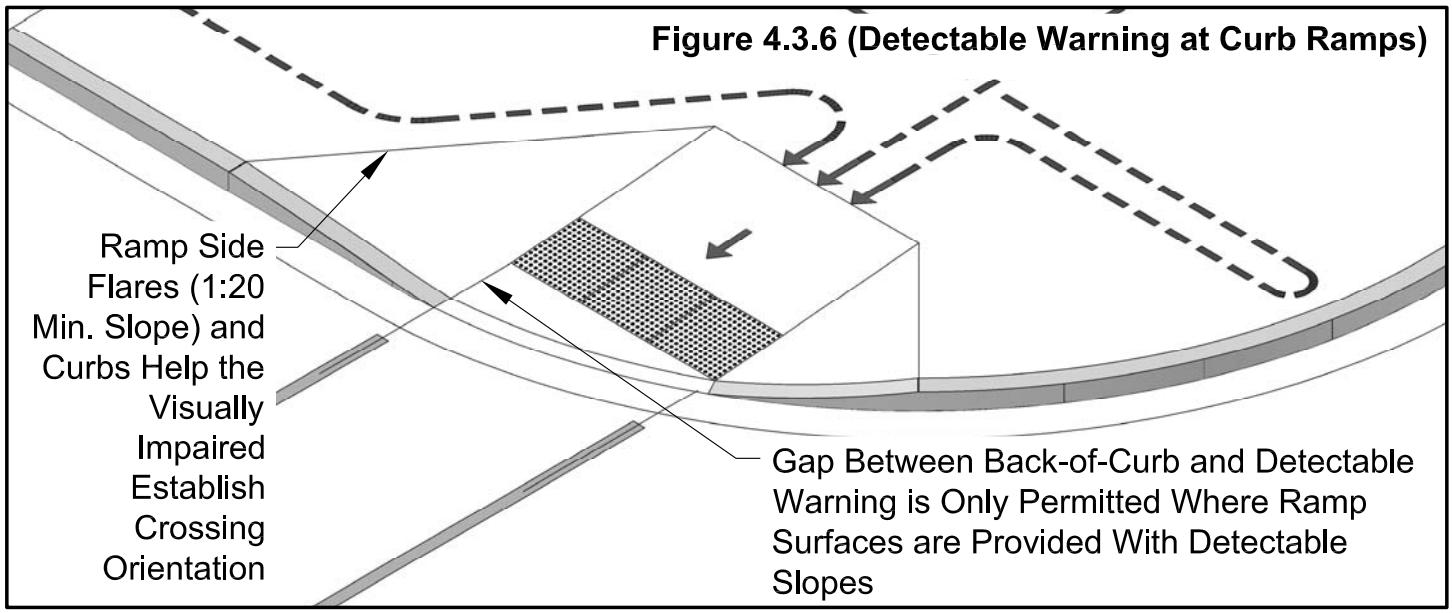


Figure 4.3.5 (Detectable Warning at Curb Ramps)

Figure 4.3.6 (Detectable Warning at Curb Ramps)



4.3.2 Curb Ramps (cont.)

To be effective the detectable warning should be located at the back-of-curb. If the existing sidewalk and curb ramp are composed of a specialty paving surface or if a monolithic curb is involved, the detectable warning must be placed no more than 8 inches from the flowline or face-of-curb. If a curb ramp is situated about a curb radius creating a setback, at least one side of the detectable warning must be located no more than 8 inches from the flowline or face-of curb. (Figures 4.3.7, 4.3.8)

If the setback between back-of-curb and bottom of ramp becomes too great, it may be confusing to those with visual impairments and can add to the time allotted to make a safe street crossing. Where the setback at ramps located at radial curbs becomes greater than 5 feet measured from the back-of-curb, the detectable warning must be located at the back-of-curb. (Figure 4.3.9)

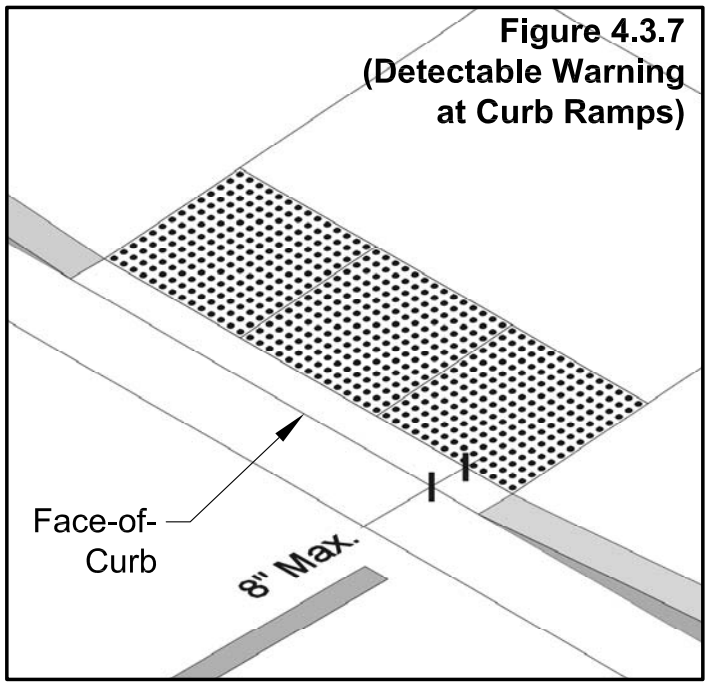


Figure 4.3.7 (Detectable Warning at Curb Ramps)

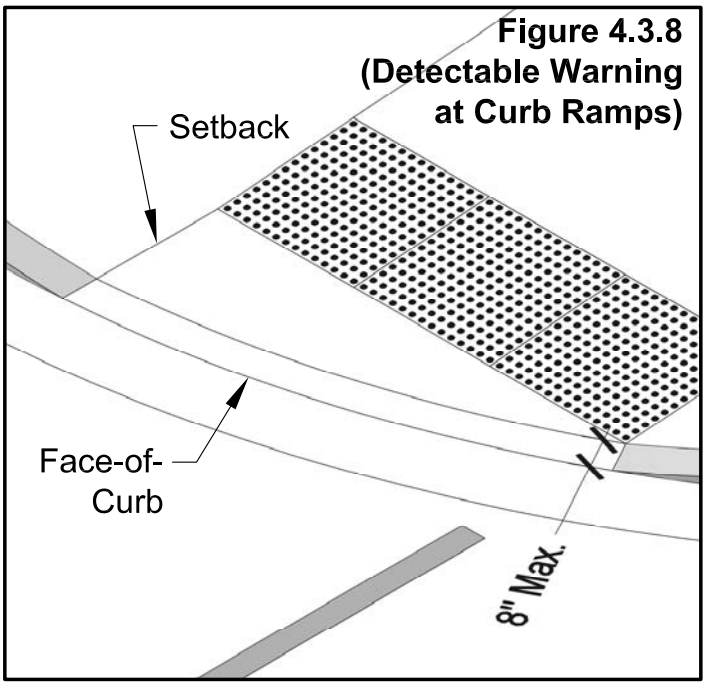


Figure 4.3.8 (Detectable Warning at Curb Ramps)

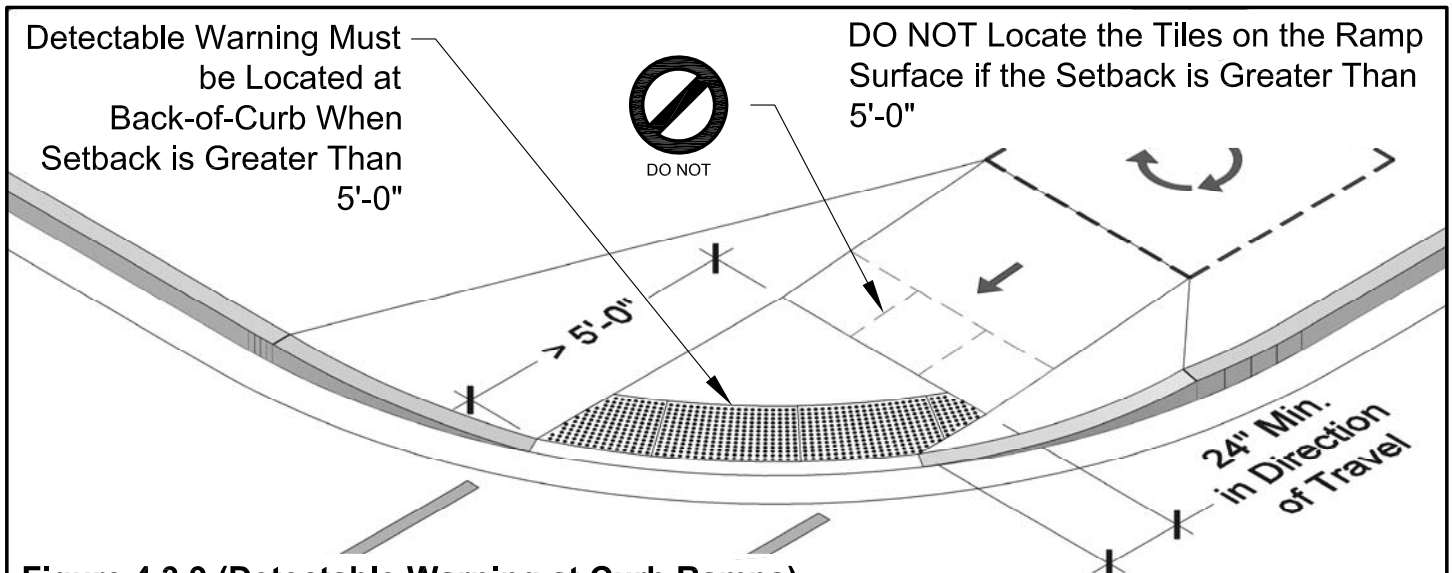


Figure 4.3.9 (Detectable Warning at Curb Ramps)

4.3.2 Curb Ramps (cont.)

The detectable warning placement at blended transition type ramps should be consistent. The ramp in this case should not affect the detectable warning placement, as the bottom ramp landing is actually still contained behind the back-of-curb within the designated sidewalk area. To place the detectable warning at the base of the ramps would not convey an appropriate message to the visually impaired, as the warning would be set back too far from the vehicular way and/or street crossing. This could increase pedestrian street crossing time or make crossing analysis difficult. (Figure 4.3.10)

Ideally, the bottom ramp landing area is confined to a minimal area and the detectable warning fits the available crosswalk layout. Where the sidewalk and street are flush, detectable warning is required regardless of the crosswalk location. (Figure 4.3.10)

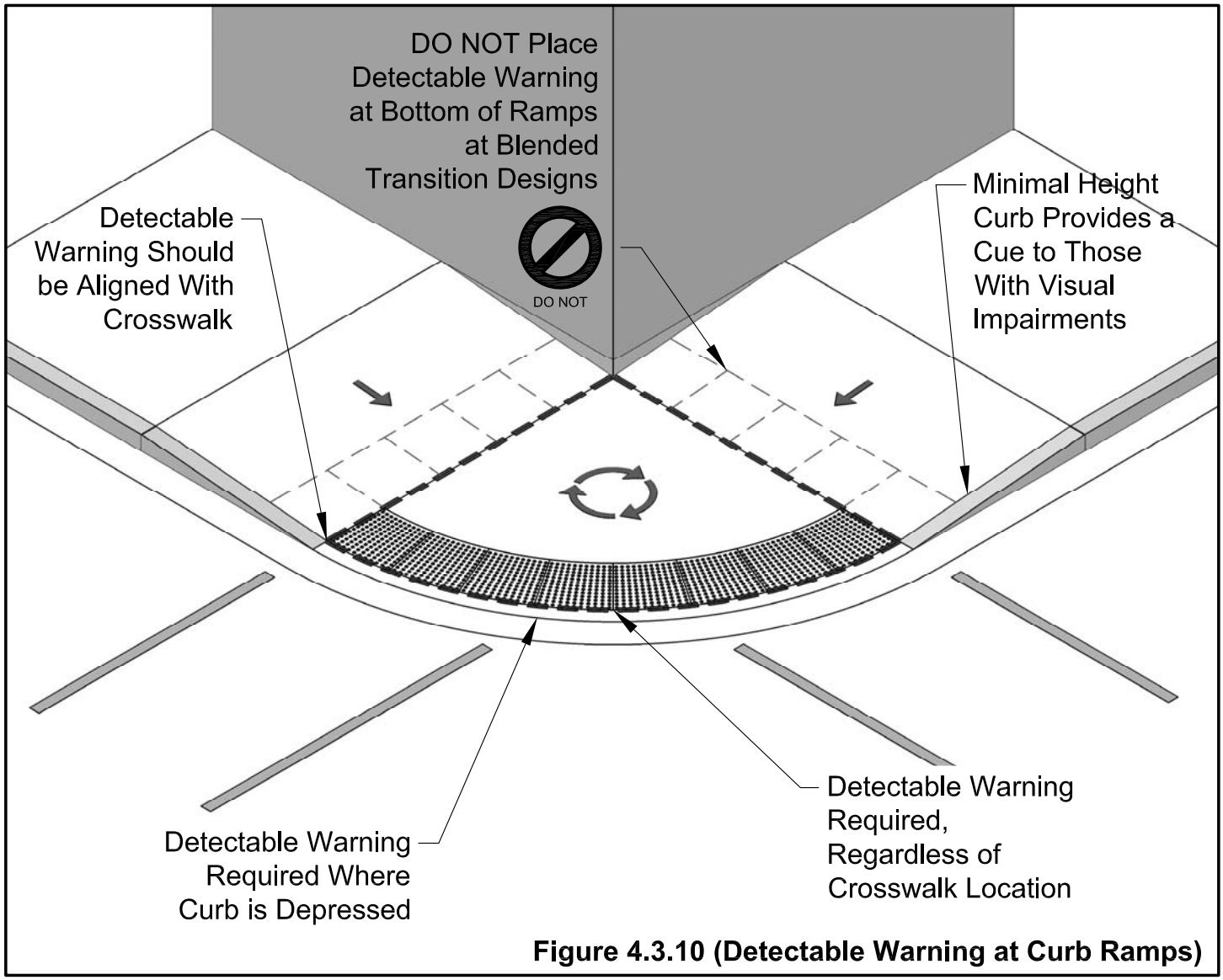


Figure 4.3.10 (Detectable Warning at Curb Ramps)

4.3.3 Alleys & Driveways

Detectable warning is not to be placed at alley and driveway crossings regardless of whether or not a ramp is necessary to connect the sidewalk to the alley or driveway crossing. Alleys and driveways are not typically heavily trafficked ways, so to provide a warning as such may be sending a confusing message to the visually impaired. With the detectable warning in place, the blind may wait unnecessarily at the edge of the alley or driveway anticipating a change in vehicular surges, signaling an appropriate crossing time. Additionally, because some pedestrians with visual impairments may establish orientation when traveling by counting city blocks, placing detectable warning at each alley and driveway could result in confusion with regard to location. (Figures 4.3.11, 4.3.12)

Only at signalized, commercial driveways with curb returns would detectable warning be appropriate. In this case, the vehicular traffic is significant and the pedestrian movement would be controlled. This type of location should be treated an intersection. (Figure 4.3.13)

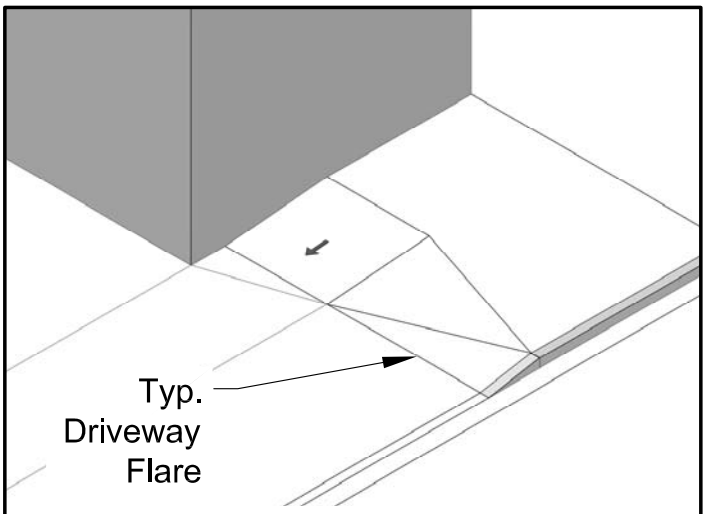


Figure 4.3.11 (Driveway Crossing)

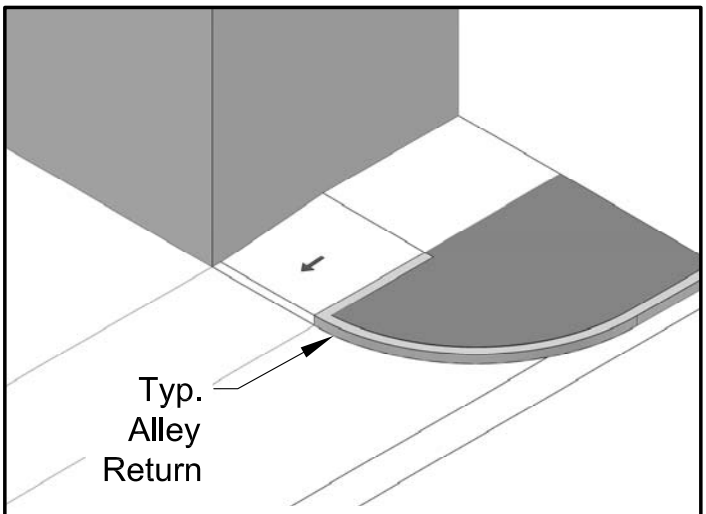


Figure 4.3.12 (Driveway Crossing)

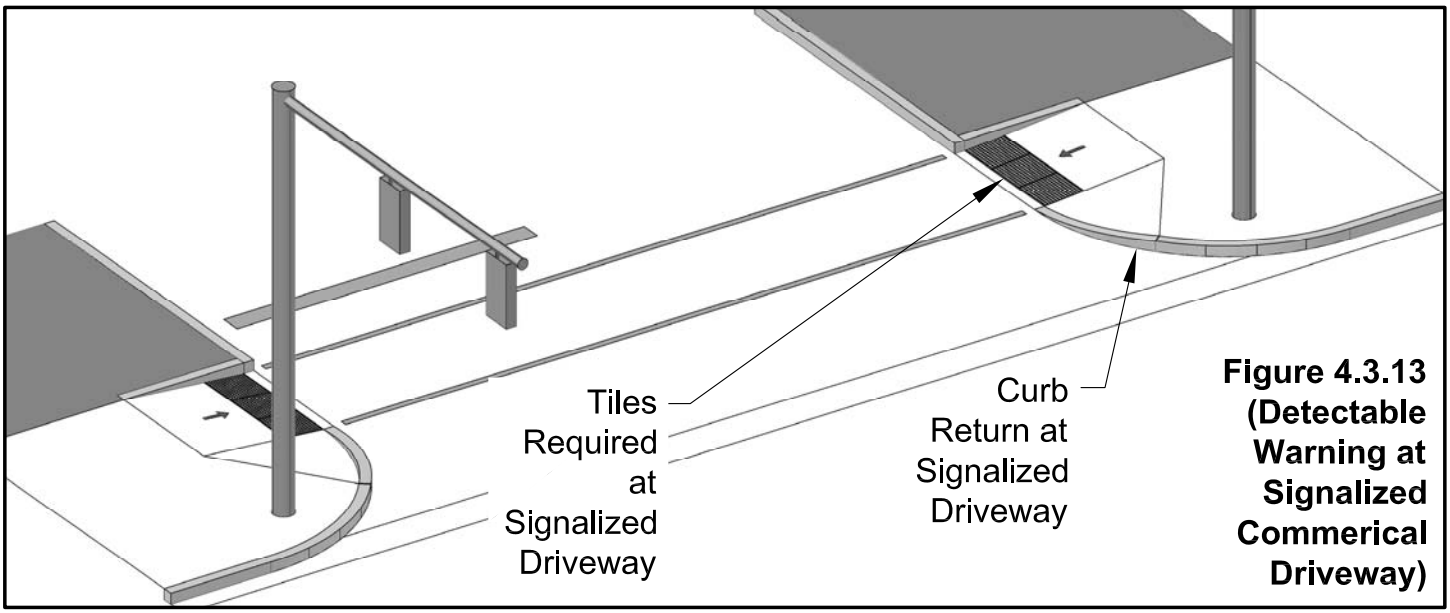


Figure 4.3.13 (Detectable Warning at Signalized Commerical Driveway)

4.3.4 Medians & Pedestrian Refuge Islands

Where medians and pedestrian refuge islands are provided at street crossings and are a minimum of 6 feet in depth in the direction of travel, detectable warning must be provided. The detectable warning must be placed at the back-of-curb of each side of the median for a minimum depth of 24 inches. A minimum of 2 feet of walkway without detectable warning must separate the two sections. This minimal area will inform the visually impaired of the limits of the refuge area safe from vehicular traffic. (Figures 4.3.14, 4.3.15)

If the median or pedestrian refuge has no curb (striping only), the detectable warning must be placed at the edge of the vehicular way. (Figure 4.3.15)

Refer to Section 5.4 for additional information regarding medians and pedestrian refuge islands.

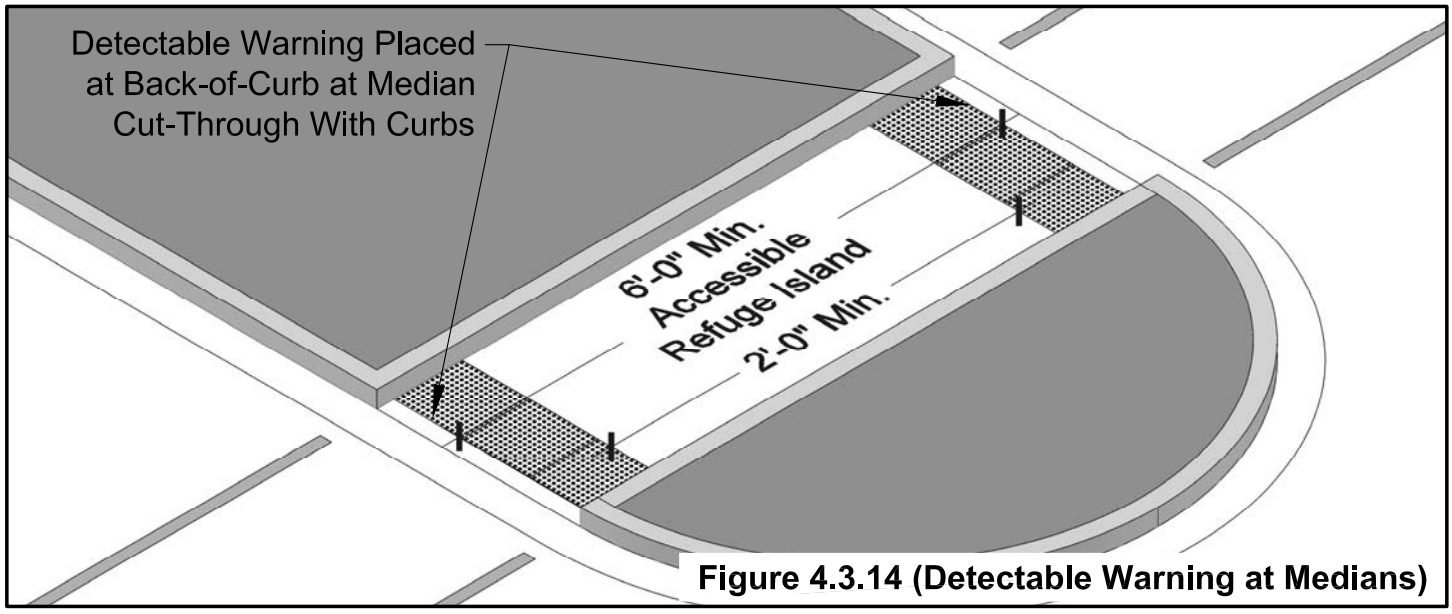


Figure 4.3.14 (Detectable Warning at Medians)

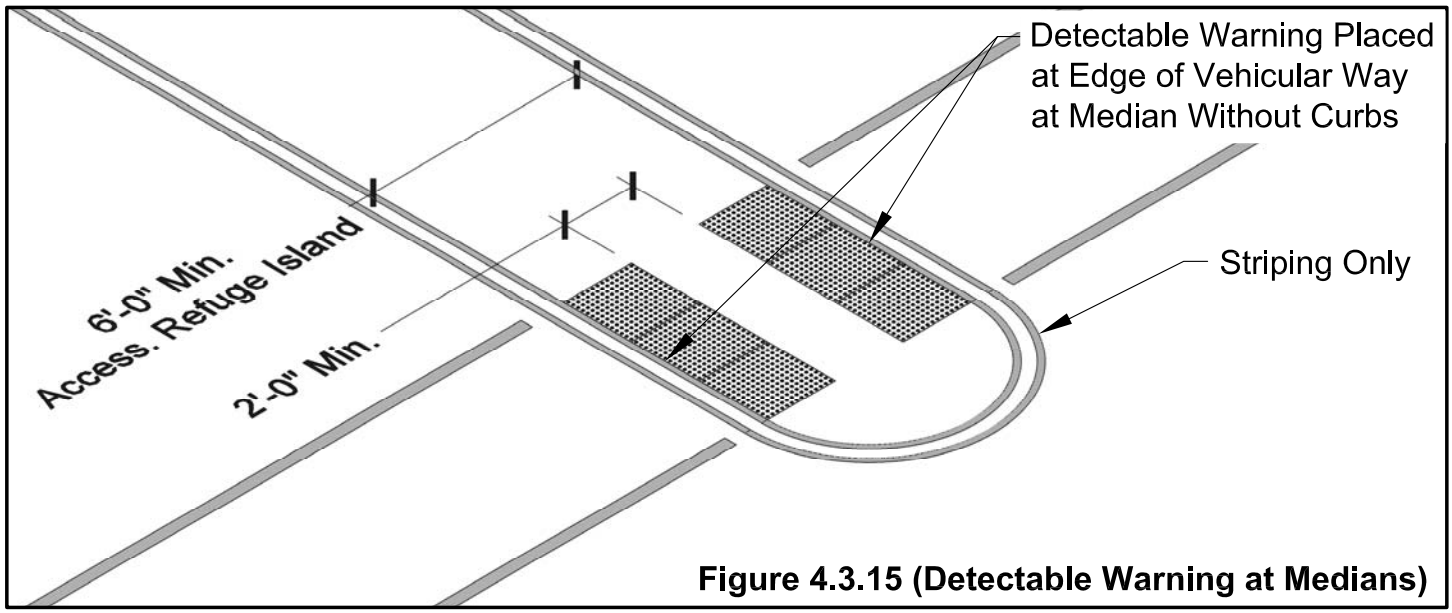


Figure 4.3.15 (Detectable Warning at Medians)

4.3.5 Rail Crossings

Though not typically a part of the public way, rail crossings also required detectable warning. If a pedestrian way intersects a rail crossing, the edge of the detectable warning closest to the crossing must be located within a range of 6 feet minimum to 15 feet maximum to the centerline of the first rail. The detectable warning should be oriented perpendicular to the path of travel.
(Figure 4.3.16)

Note: Refer to ADAAG for surface requirements where accessible route crosses railing.

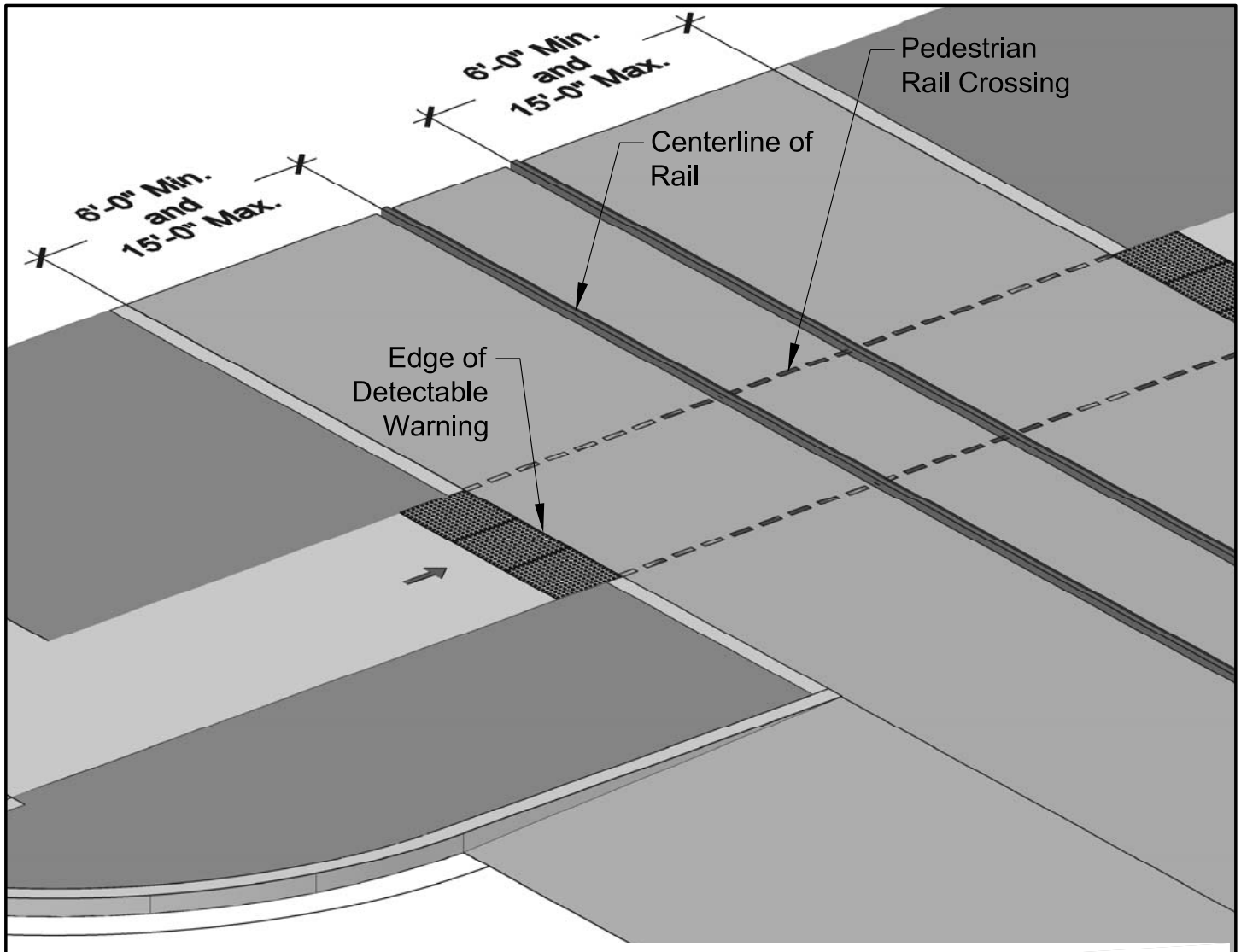


Figure 4.3.16 (Detectable Warning at Rail Crossings)

5.0 Accessible Street Crossings

5.1 Accessible Street Crossings - Overview

This section will discuss design considerations with regards to providing accessible street crossings for pedestrians with disabilities. Good design typically balances the needs of the pedestrian with those of the vehicle users.

Particularly important is the need to consider and properly address the challenges that pedestrians with disabilities may face when attempting a street crossing. This section will address different intersection and crosswalk characteristics that may affect the ability to make a safe and accessible street crossing including intersections with complex geometry, the use of medians and/or pedestrian refuge islands, mid-block crossings, tee intersections, the potential for removing existing crossings, and the use of accessible pedestrian signals (APS).

When designing for the safe and efficient movement of traffic, it is extremely important to develop consistency from one intersection to the next in terms of placing traffic signals, striping and signage. It is equally important to use similar principles when considering accessible pedestrian street crossings. Crossings, curb ramps, and pushbuttons (where applicable) should be located consistently to eliminate unnecessary confusion or difficulties for pedestrians with disabilities.

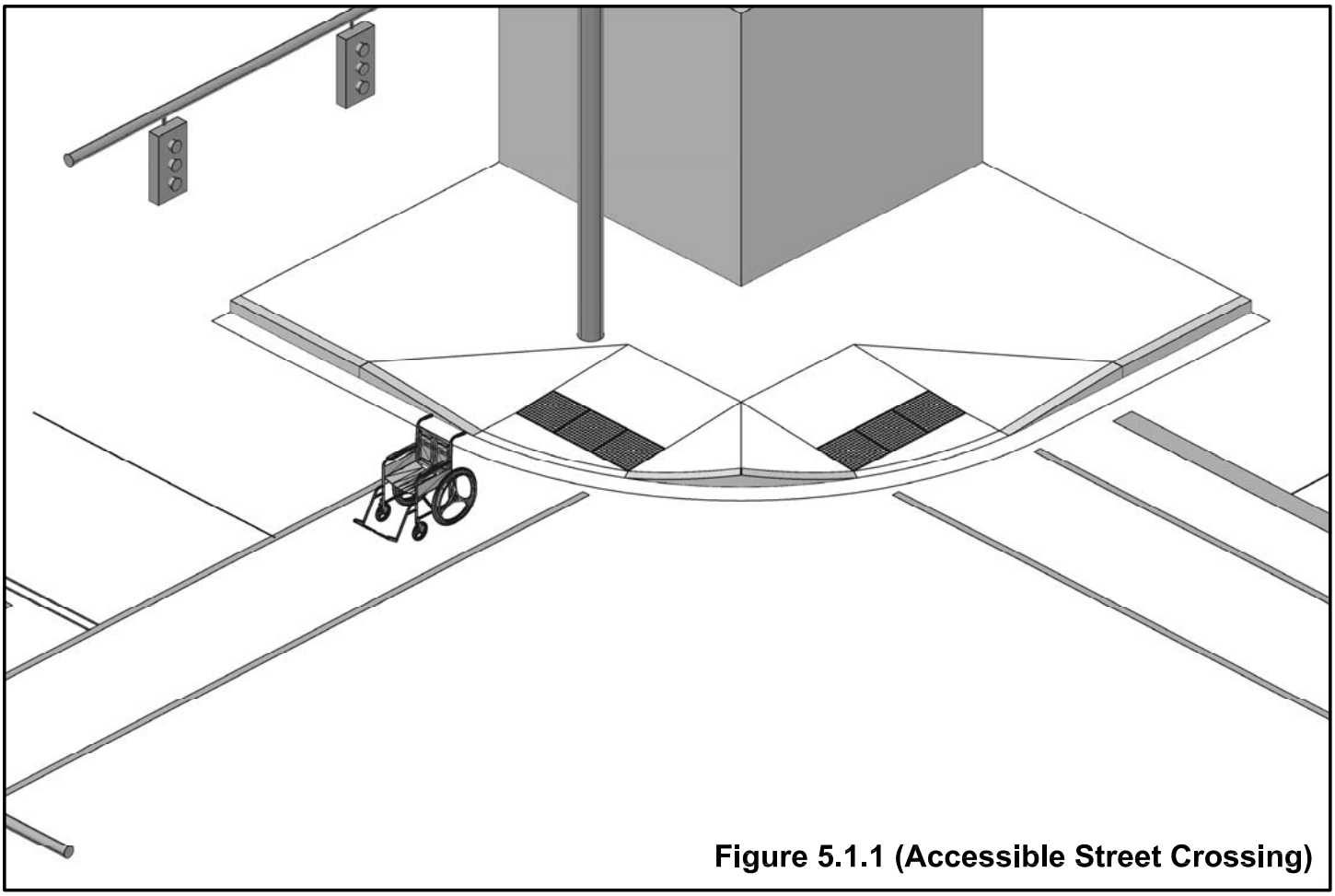


Figure 5.1.1 (Accessible Street Crossing)

5.2 Accessible Street Crossings - Requirements & Design Considerations

5.2.1 Pedestrian Access to Crosswalk (General Concepts)

Safety

For the safety of pedestrians that rely on a wheelchair or other type of mobility assistive device, it is imperative that a connection to a street crossing **not be provided** if the opposite side of the crossing remains closed with a full height curb.

A pedestrian in a wheelchair detecting a connection from the sidewalk to the street on the near side may proceed into the street in attempt to make the crossing. However, reduced site lines may result in the inability to see that a ramped connection is not provided on the opposite side of the street. Upon arrival at the far side of the crossing, the pedestrian is becomes stranded in the vehicular way with no way up to the safety of the sidewalk. Additionally, there is not likely available time to turn around to return back to the starting point of the crossing. (Figure 5.2.1)

The Federal Highway Administration (FHWA) broadly defines that any location where the sidewalk intersects the curb is considered a street crossing, whether marked with a crosswalk or not. The first reaction of a designer is to provide accessible curb ramps and a marked street crossing at such locations. However, should the street crossing be provided without accessible curb ramps or a connection to the crossing, a case for discrimination against those with disabilities could be made. If a traffic engineering study or any other extenuating circumstance reveals the need to close a pedestrian street crossing, **it should in fact be closed to all pedestrians**.

In instances where the scope of work for a particular project impacts only one corner of the intersection, it is important to consider the other corners before proceeding with an isolated improvement. Upon evaluation, the scope of work for the project may be expanded to include adjacent areas to provide for a fully functional and accessible street crossing.

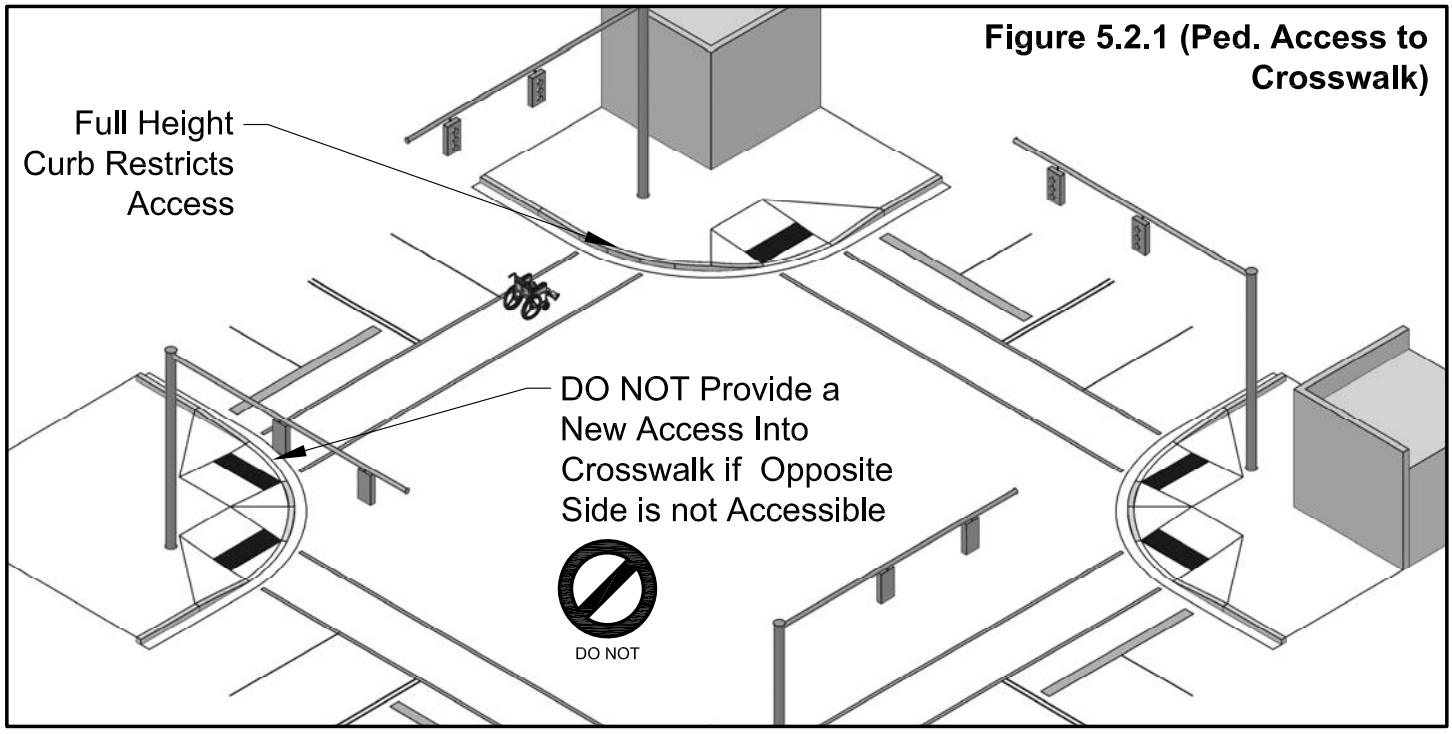


Figure 5.2.1 (Ped. Access to Crosswalk)

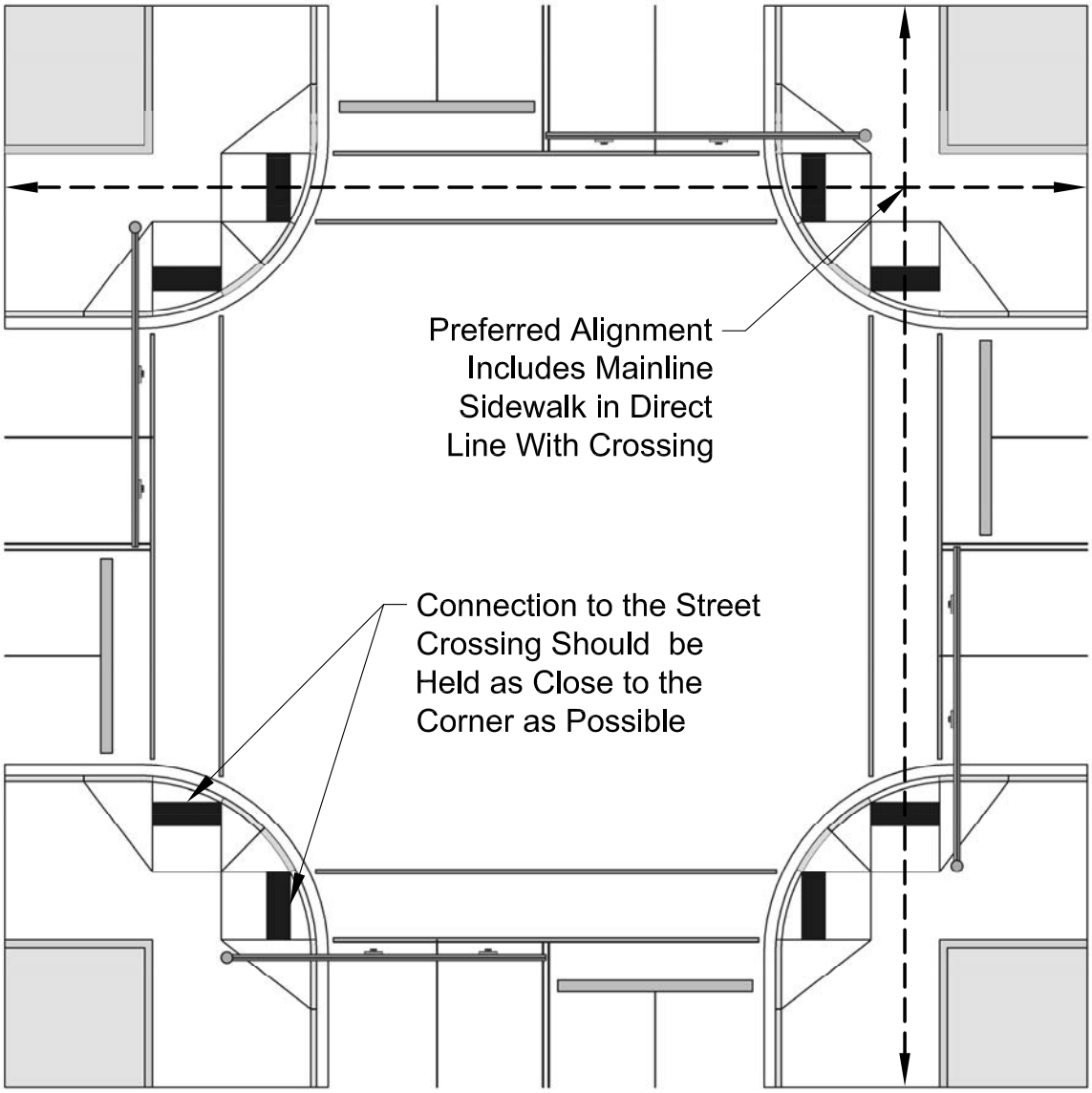
5.2.1 Pedestrian Access to Crosswalk (General Concepts) (cont.)

Alignment

Preferably, the crosswalks and connection from the sidewalk remain in direct alignment with the mainline sidewalk at the property line. This alignment minimizes confusion for a pedestrian with visual impairments approaching the intersection from the mainline walk. Pedestrians with mobility assitive devices are not forced to perform any restrictive maneuvers to reach the ramp landing or the edge of street.

The connection to the street, whether by curb ramps or a flush transition, should be held as close to the corner of the intersection as possible. This preferred design fosters the aforementioned consistency of features that can be key in assisting some pedestrians negotiating the intersection. The proximity to the corner also may provide motorists an unobstructed view of the pedestrians in the crosswalk or waiting to perform the crossing. (Figure 5.2.2)

Figure 5.2.2 (Ped. Access to Crosswalk)



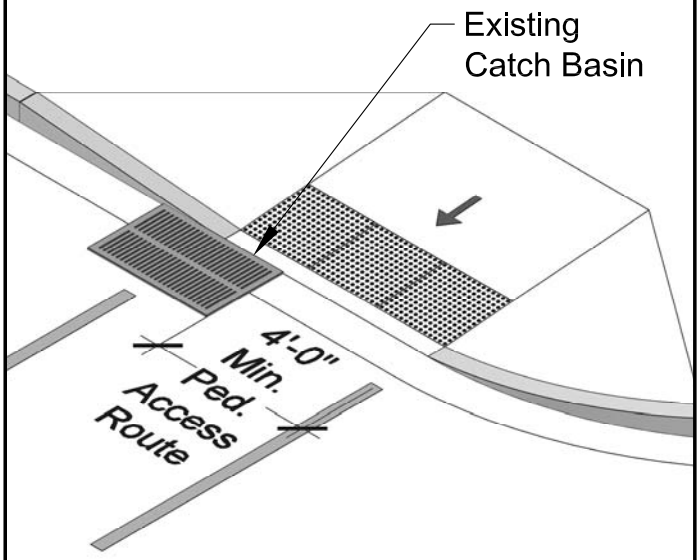
5.2.1 Pedestrian Access to Crosswalk (General Concepts) (cont.)

Clear Pedestrian Access Route

Whether the connection from a sidewalk to the crosswalk is made with a curb ramp or a flush transition, a pedestrian access route must be provided to the crosswalk. While the preferred width for a curb ramp is 6 feet, the pedestrian access route could be maintained at 4 feet minimum when an existing conflict is encountered. (Figure 5.2.3)

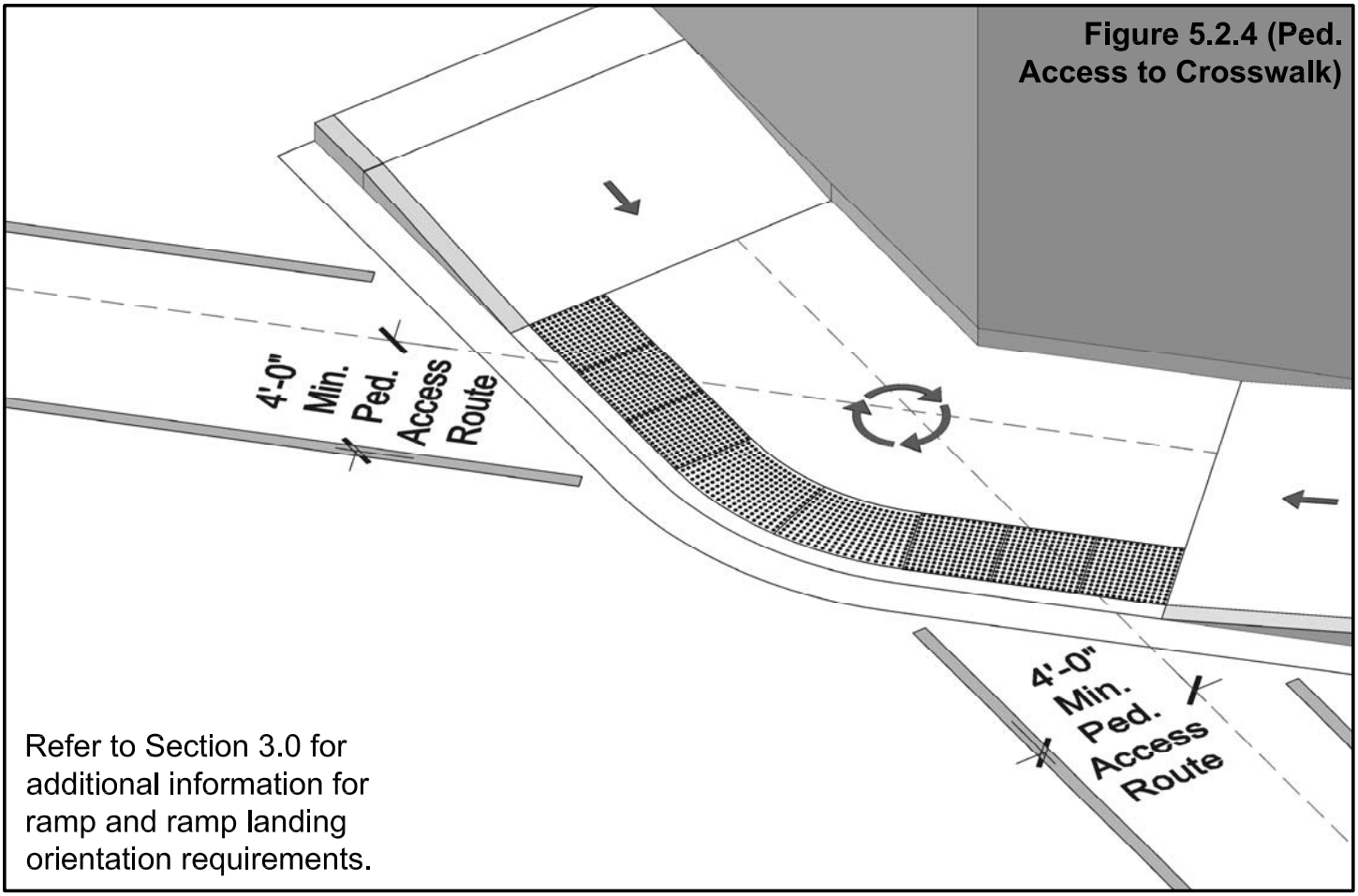
Where unusual intersection geometry applies, it is required to maintain the 4 foot minimum pedestrian access route to the crosswalk. (Figure 5.2.4)

Figure 5.2.3 (Ped. Access to Crosswalk)



Note: If the existing utility cover or catch basin lid satisfies the requirements of an accessible route, there is no issue with its location. (Refer to Section 2.0)

Figure 5.2.4 (Ped. Access to Crosswalk)



Refer to Section 3.0 for additional information for ramp and ramp landing orientation requirements.

5.2.1 Pedestrian Access to Crosswalk (General Concepts) (cont.)

Crossing Time

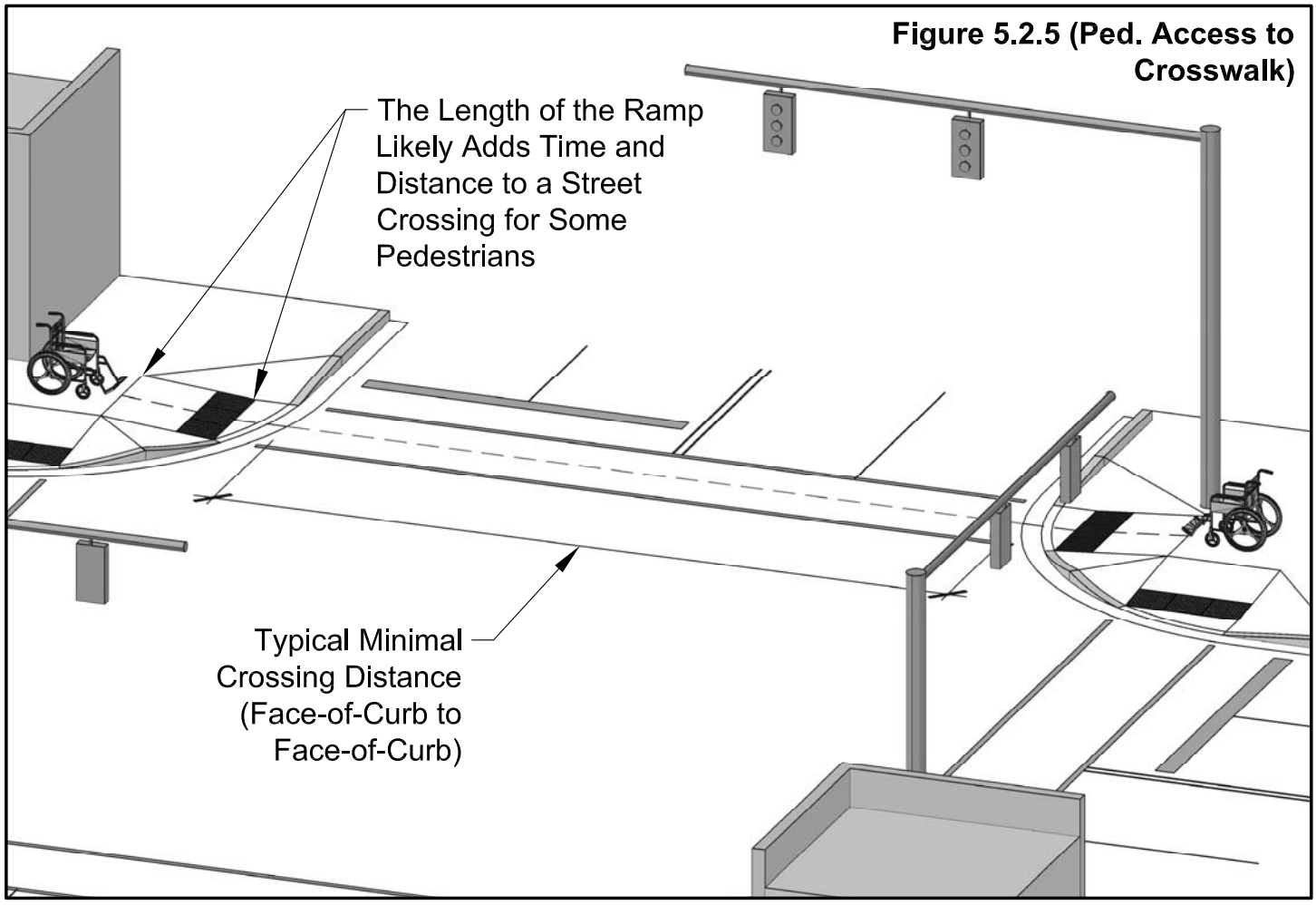
Pedestrians do not all require the same amount of time to cross an intersection; typically, but not always, a pedestrian with disabilities will require a greater length of time to perform a crossing. Formulas for caluculating street crossing time vary depending on the referenced source.

The MUTCD recommends a walking speed of 4 feet per second for the pedestrian crossing phase at signalized intersections. PROWAG requires that a walking speed of 3.5 feet per second be the maximum rate to be used, and the calculation should include the entire length of the crosswalk (typically from face-of-curb to face-of-curb, Figure 5.2.5).

In addition, the prospect that some pedestrians may travel slower than the MUTCD recommended 4 feet per second must be considered. If the existing street is wide enough, a traffic engineer may have an opportunity to plan for a median or pedestrian refuge island to effectively break the wide crossing distance into two sections (refer to Section 5.3.3).

Further consideration includes pedestrians with mobility assistive devices. Typically, these pedestrians will be waiting for the opportunity to cross the street from the level landing area at the top of the curb ramp. For these pedestrians, the crossing distance is increased and it is important to acknowledge the additional travel time necessary. (Figure 5.2.5)

Figure 5.2.5 (Ped. Access to Crosswalk)



5.2.2 Crosswalks

Street crossings, whether marked or not, are required to be accessible as they serve as the pedestrian accessible route across the street. A marked crosswalk defines the location pedestrian and the motorists of an available street crossing. Per MUTCD and PROWAG, the minimum width for a marked crosswalk is 6 feet. Ideally, the entire width and length of the marked crosswalk will be made accessible. However, the requirements for an accessible route should be adhered to for a minimum width of 4 feet across the intersection at each street crossing location.

Additionally, a safe buffer zone between the marked crosswalk and the parallel vehicular lane must be provided. A minimum of 2 feet is required from the edge of the vehicular lane (face-of-curb line extended) to the crosswalk stripe nearest the center of the intersection. (Figure 5.2.7)

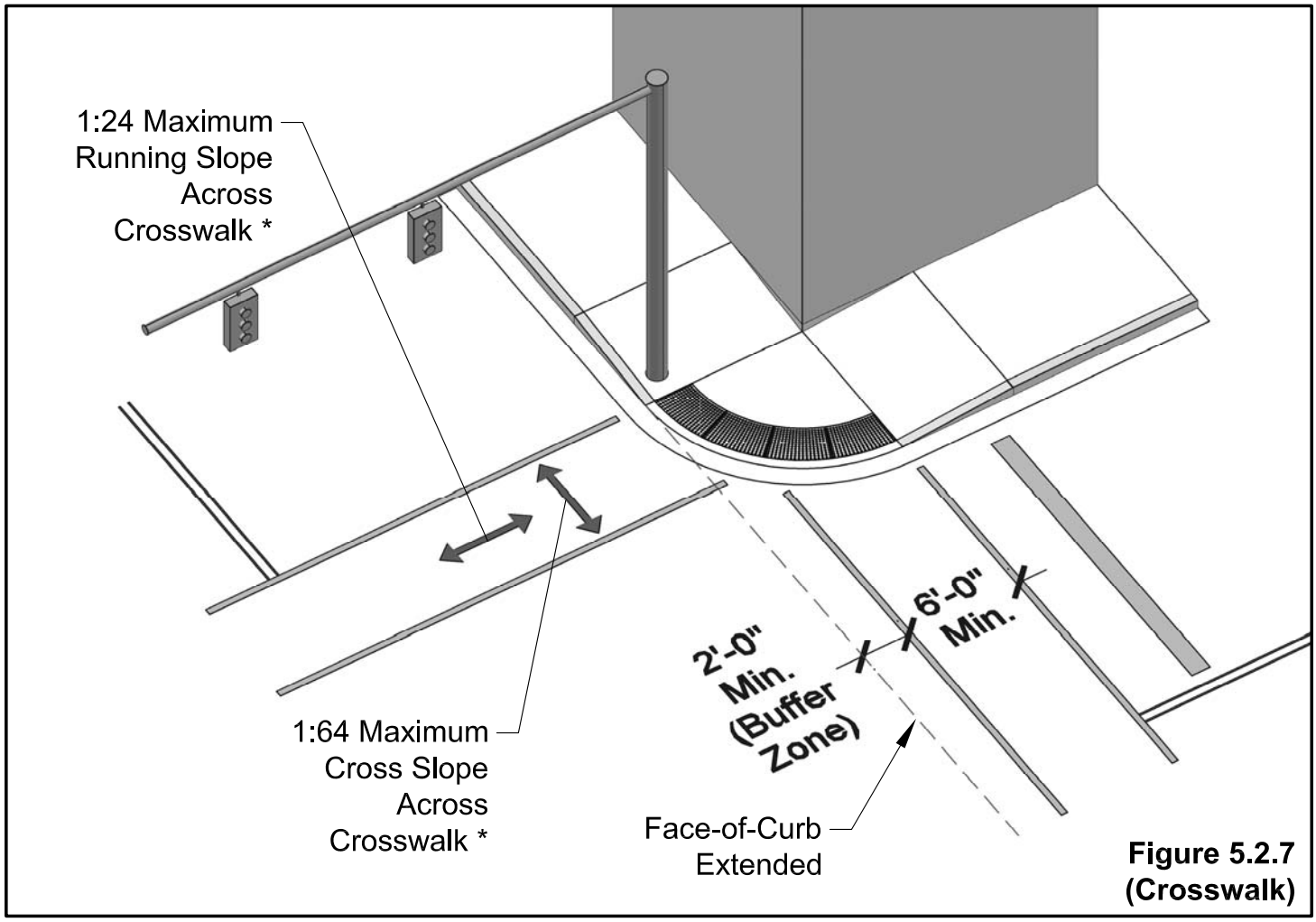


Figure 5.2.7 (Crosswalk)

* Per PROWAG, the maximum running slope on a crosswalk is 1:20. The maximum cross slope on a crosswalk is 1:48; if an intersection has no stop control, the maximum cross slope on a crosswalk is 1:20.

5.3 Accessible Street Crossings - Geometry Issues

5.3.1 Alignment of Crosswalk

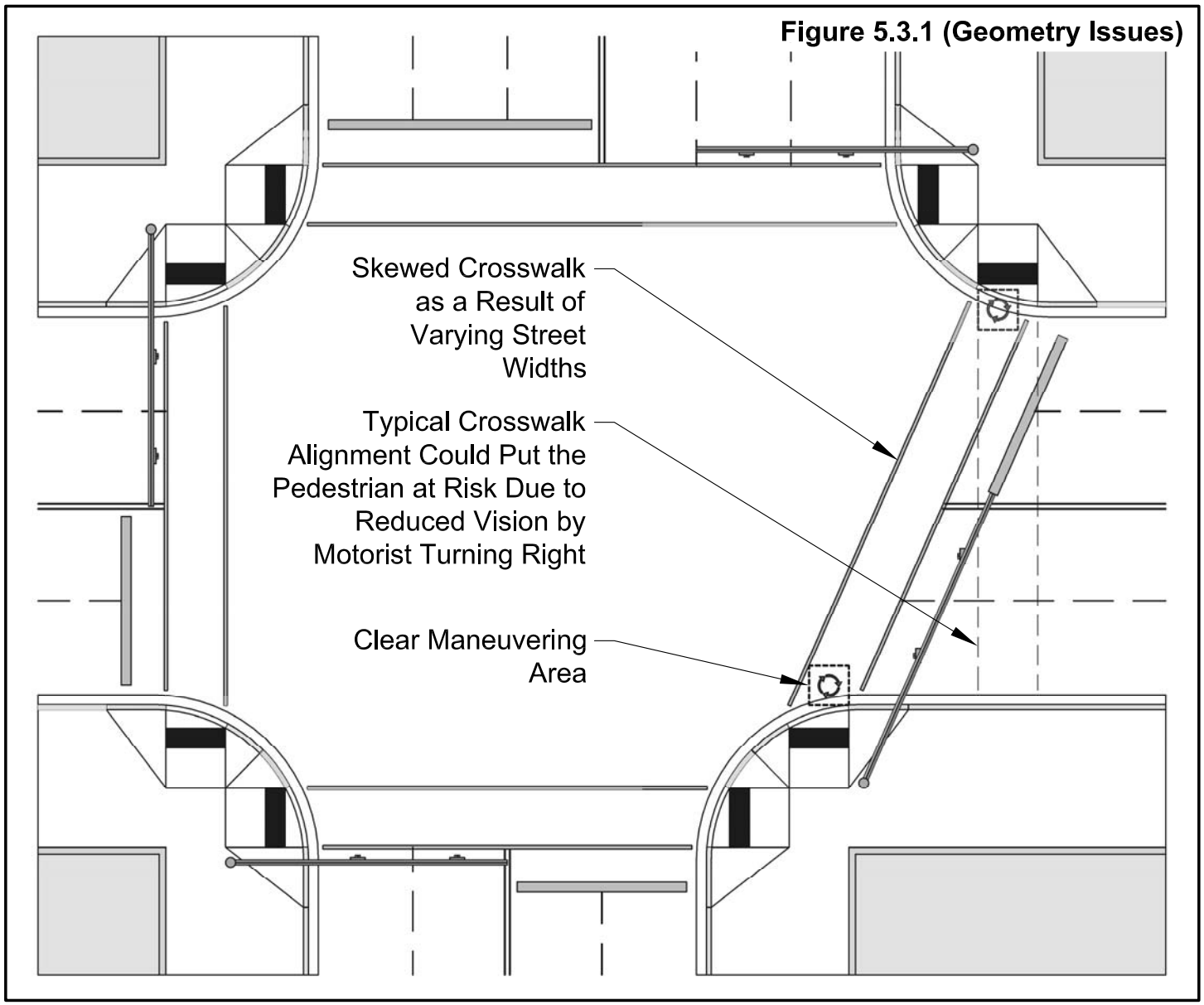
At times the alignment of the intersection is affected by offset varying street widths. In such cases, the crosswalk may need to be skewed to connect the two corners of the intersection that do not align. (Figure 5.3.1)

Additionally, where diagonal streets intersect typical orthogonal streets, crosswalk alignment should be parallel to the adjacent vehicular lane. (Figure 5.3.2, next page)

The safest crosswalk alignment for the blind and visually impaired pedestrian is always parallel to the adjacent vehicular lane. The blind and visually impaired use the sound of the surging traffic to determine a safe crossing time; the sound of the moving traffic can help determine the orientation of a street crossing. The skewed crosswalk should only be used if absolutely necessary. (Figure 5.3.1)

Where a curb ramp and a street crossing do not align, a 4 foot x 4 foot minimum clear maneuvering area must be provided.

Figure 5.3.1 (Geometry Issues)



5.3.1 Alignment of Crosswalk

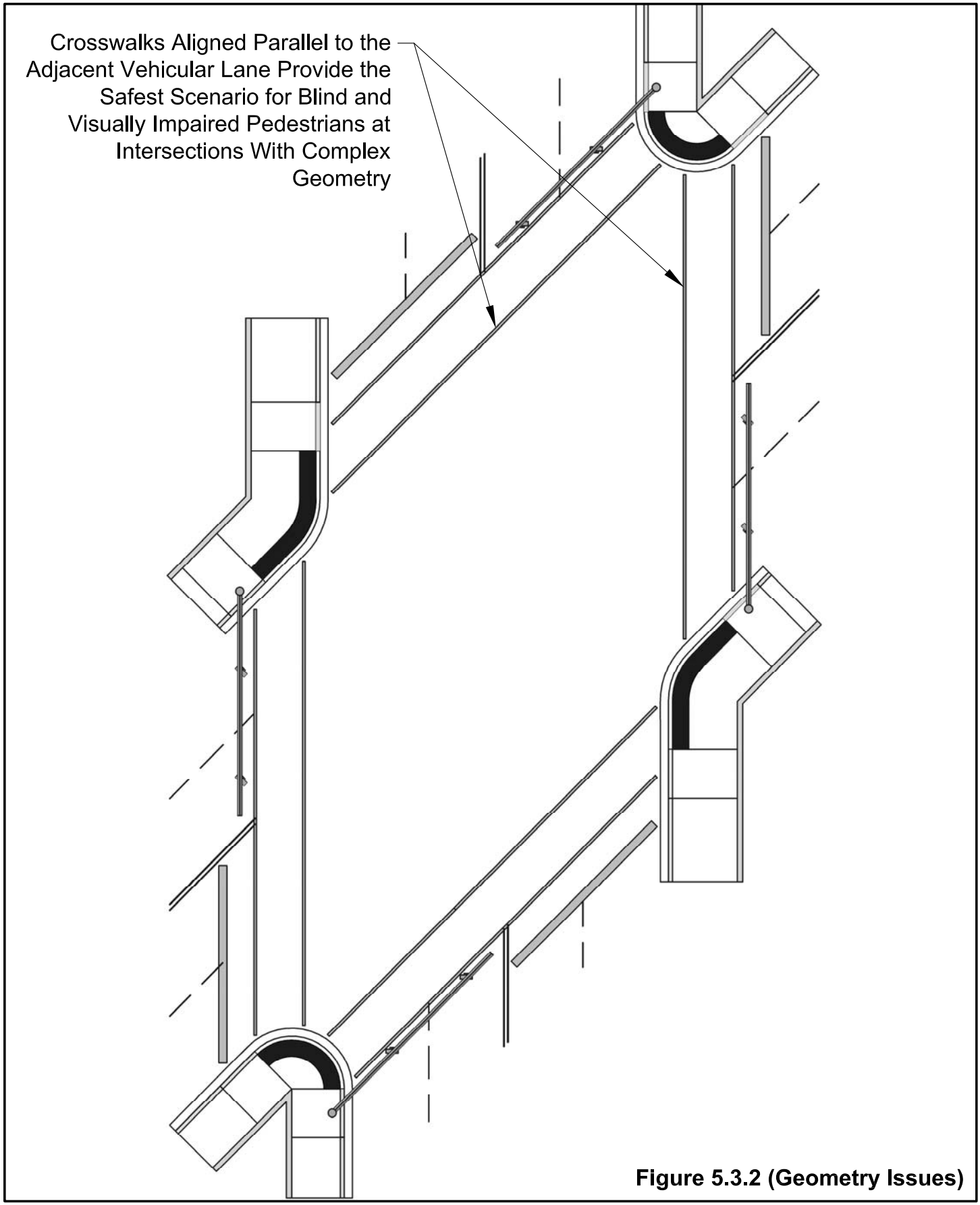


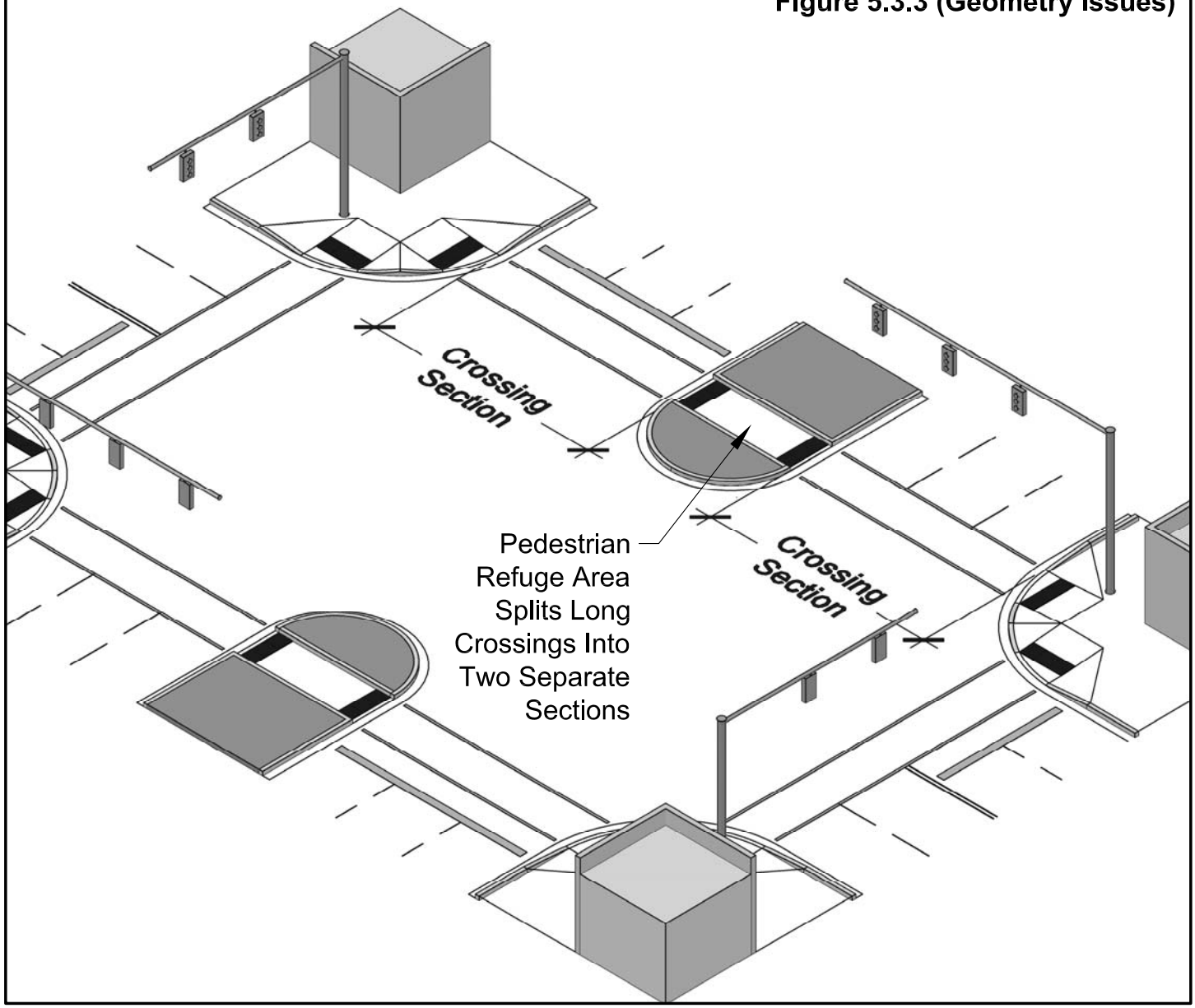
Figure 5.3.2 (Geometry Issues)

5.3.2 Wide Streets

The MUTCD required 4 feet per second pedestrian street crossing time may not be adequate for pedestrians that are unable to travel at this speed. Medians or refuge islands are design options when long street crossings are required of pedestrians. These facilities can effectively split the street crossing into two negotiable sections, providing a safe resting point for pedestrians that require additional crossing time because of slower traveling speeds. Provided that such a design option will work with traffic patterns, the median or refuge island can offer protection for the pedestrian as well as serving as a physical barrier to the motorist. (Figure 5.3.3)

Refer to Section 5.4 for additional requirements at medians and pedestrian refuge islands.

Figure 5.3.3 (Geometry Issues)



5.4 Accessible Street Crossings - Medians & Pedestrian Refuge Islands

5.4.1 Median Cut-Through

A median cut-through may be provided as the pedestrian access route through a median at the elevation of the street. The running slope must be maintained at a maximum of 1:24; slopes higher than 1:20 are ramps and therefore require ramp landings. (Figures 5.4.1, 5.4.2) A high point may be necessary for drainage purposes at a median cut-through.

5.4.2 Ramped at Median

If it is necessary to ramp up to the top of the median for pedestrian access or other reasons, the typical ramp requirements apply (refer to Section 3.0). Two ramps opposing one another cannot meet at an apex and a top ramp landing must be provided to allow safe passage for wheeled devices as well as a chance for resting if necessary. (Figure 5.4.2) If ramps are offset from one another, there must be an accessible route provided from one ramp to the other.

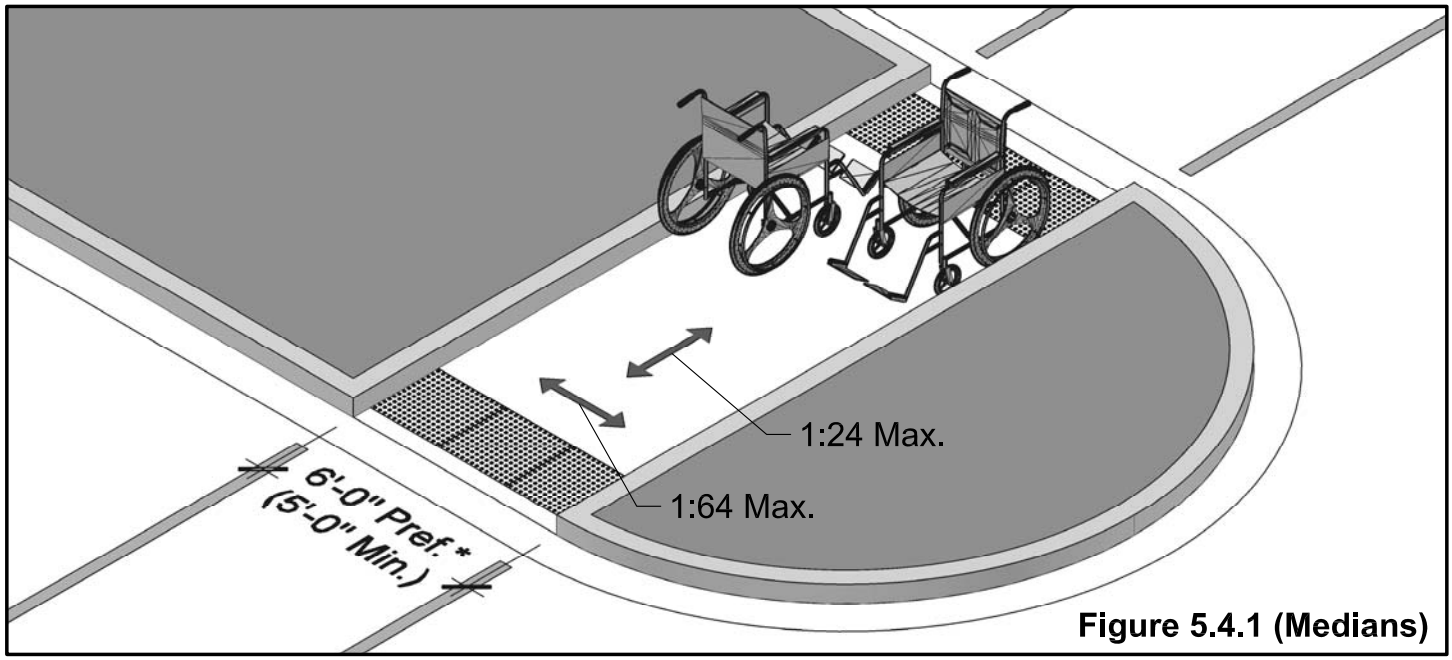


Figure 5.4.1 (Medians)

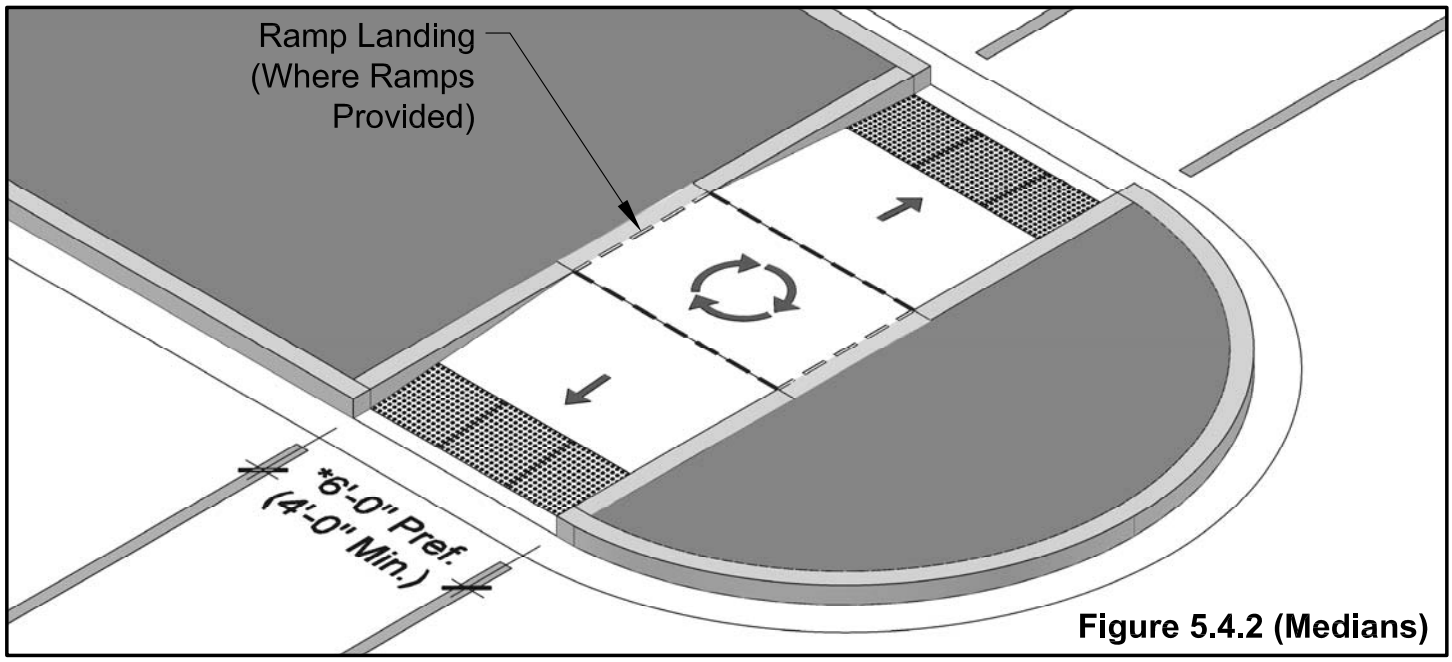


Figure 5.4.2 (Medians)

* A clear width of at least 5'-0" minimum is recommended to allow passage of two wheelchairs.

Note: Refer to Section 4.3.4, page 87 for detectable warning requirements at medians.

5.4.3 Channelization Medians

Where turn channelization medians are designed at intersections or driveways, the same median requirements apply whenever pedestrians must maneuver through the median.

The cut-through sections of the median should be aligned with the crosswalk to provide crossing information to the blind and visually impaired. The detectable warning surface must be provided at the edge of the vehicular way (at the back-of-curb). (Figure 5.4.3)

Refer to Section 5.4.2 for additional information.

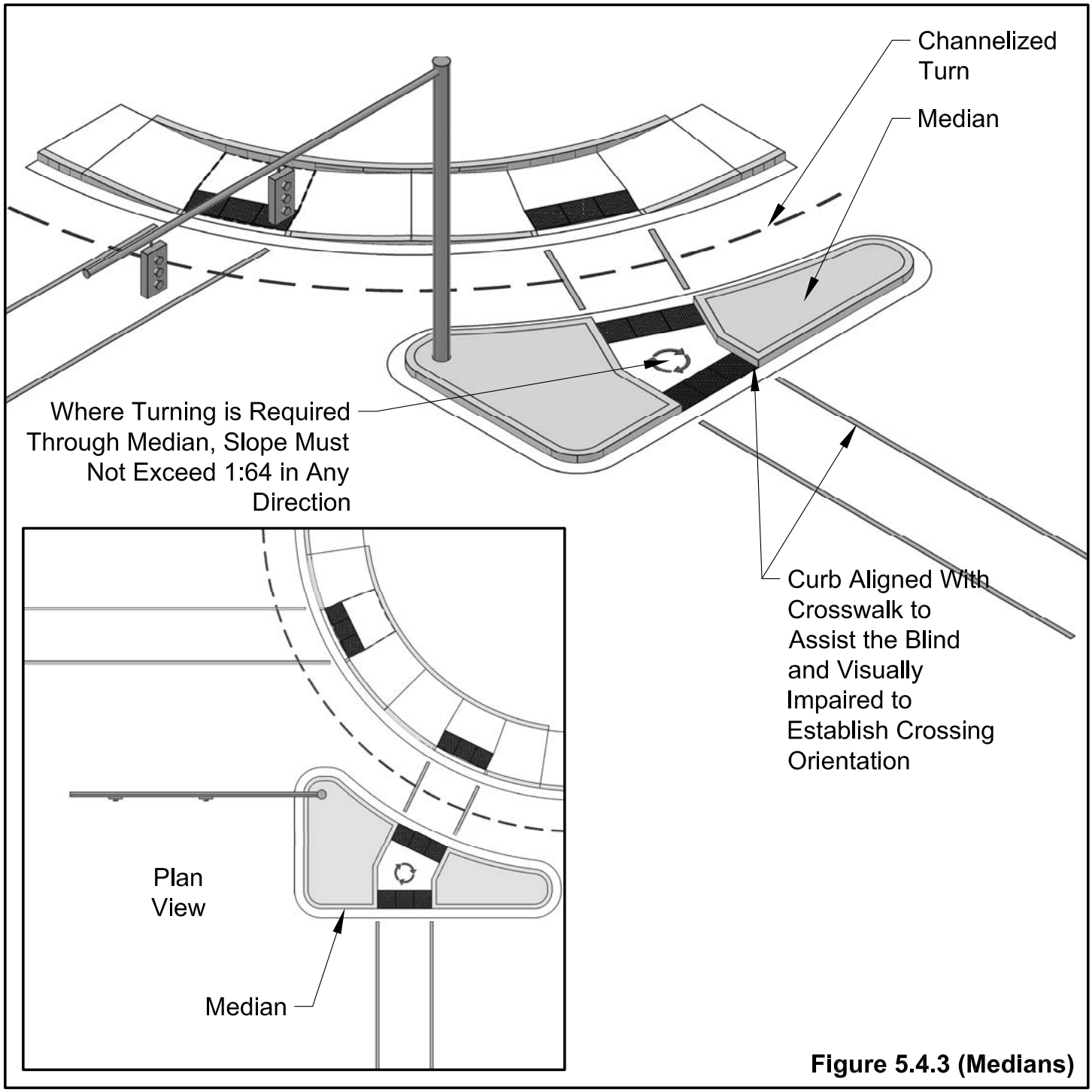


Figure 5.4.3 (Medians)

5.5 Accessible Street Crossings - Mid-Block Crossings

Where mid-block street crossings are provided, the same general requirements apply for pedestrian access to the crosswalk (refer to Section 5.2). Where pavement marking is provided, the minimum width of the crosswalk is 6 feet minimum. For mid-block crossings only, the cross slope is permitted to meet the street or highway grade. (Figure 5.5.1)

If a curb ramp or flush transition provides access for a mid-block crossing, the opposing side must also provide an accessible connection to the crossing.

Because a mid-block crossing location may not always be easily located by the blind and visually impaired, it is important to consider providing an audible locator tone to let these pedestrians know that a street crossing is available. The combination of the slopes of the ramp, the detectable warning, and a locator tone should provide enough information to locate the street crossing. Refer to Section 5.7 for information regarding accessible pedestrian signals (APS).

Mid-block crossings may be necessary street crossings in certain areas. However, the use of these types of crossings should be limited due to the safety concerns. Without significant warning or visual information, motorists may not expect pedestrian crossings. Signage, pavement marking, and possibly a traffic calming measure (raised crosswalks) may assist motorists in detecting the mid-block crossings. **Before a connection to the street at a mid-block location is improved or newly installed, an analysis to determine whether or not the crossing is in fact warranted should be conducted.**

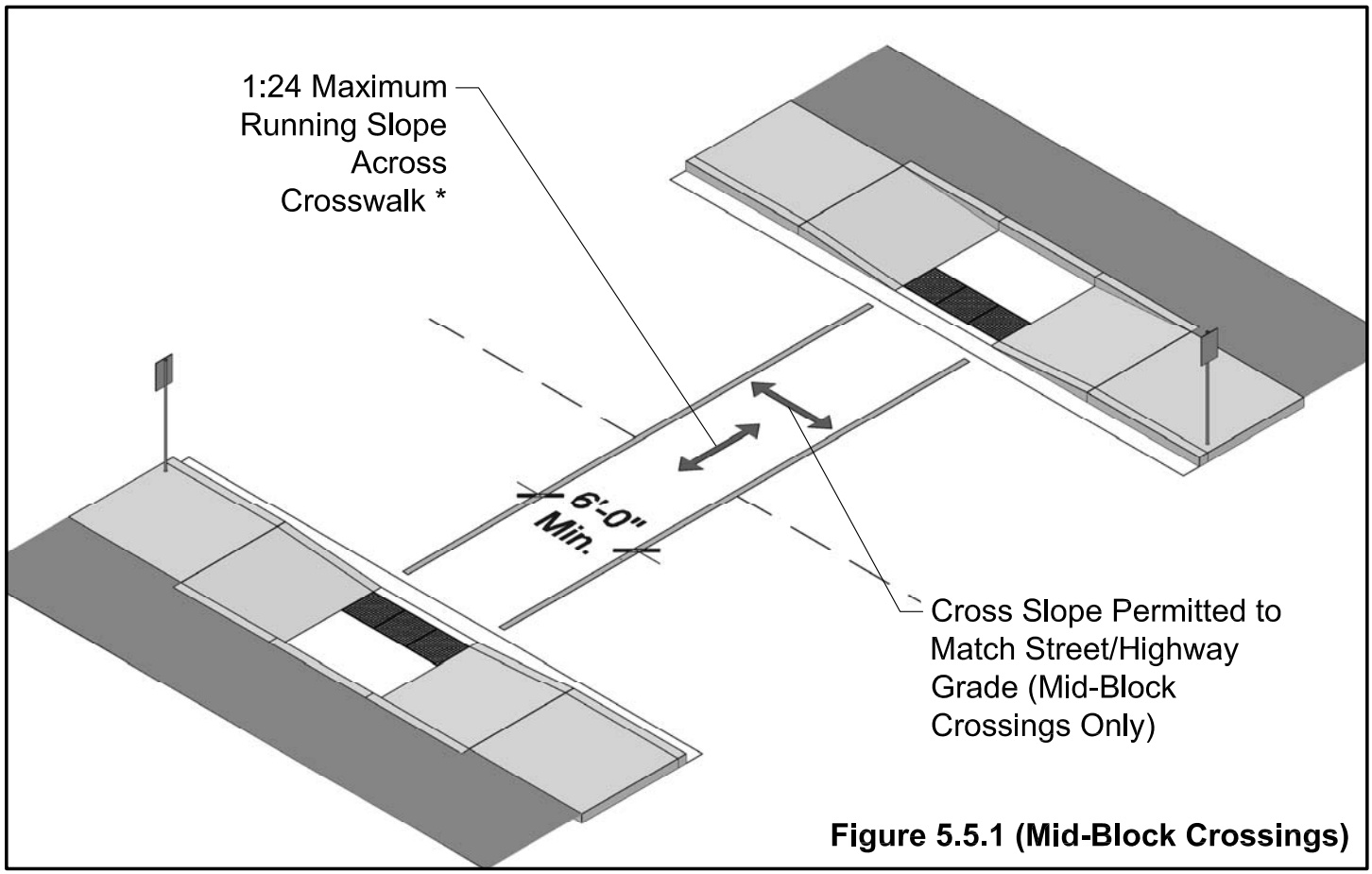


Figure 5.5.1 (Mid-Block Crossings)

* Per PROWAG, the maximum running slope on a crosswalk is 1:20.

5.6 Accessible Street Crossings - Tee Intersections

5.6.1 Crossing Interpretation

A street that intersects and terminates at another street results in what is commonly known as a 'tee intersection.' Regardless of whether or not the intersection is signalized or the crosswalks are marked, the goal is to maintain maintain accessible crossings at each of the three legs of the tee if possible. (Figure 5.6.1)

When improving a tee intersection, it may be necessary to provide an additional crossing where one of the legs of the tee does not currently include curb ramps or an accessible connection to the street crossing. This could provide relief for a pedestrian traveling from 'A' to 'B' in Figure 5.6.2 (next page) relying on a mobility assistive device. The route to travel could be shortened and the safety of the pedestrian would be improved by not having to perfrom multiple street crossings.

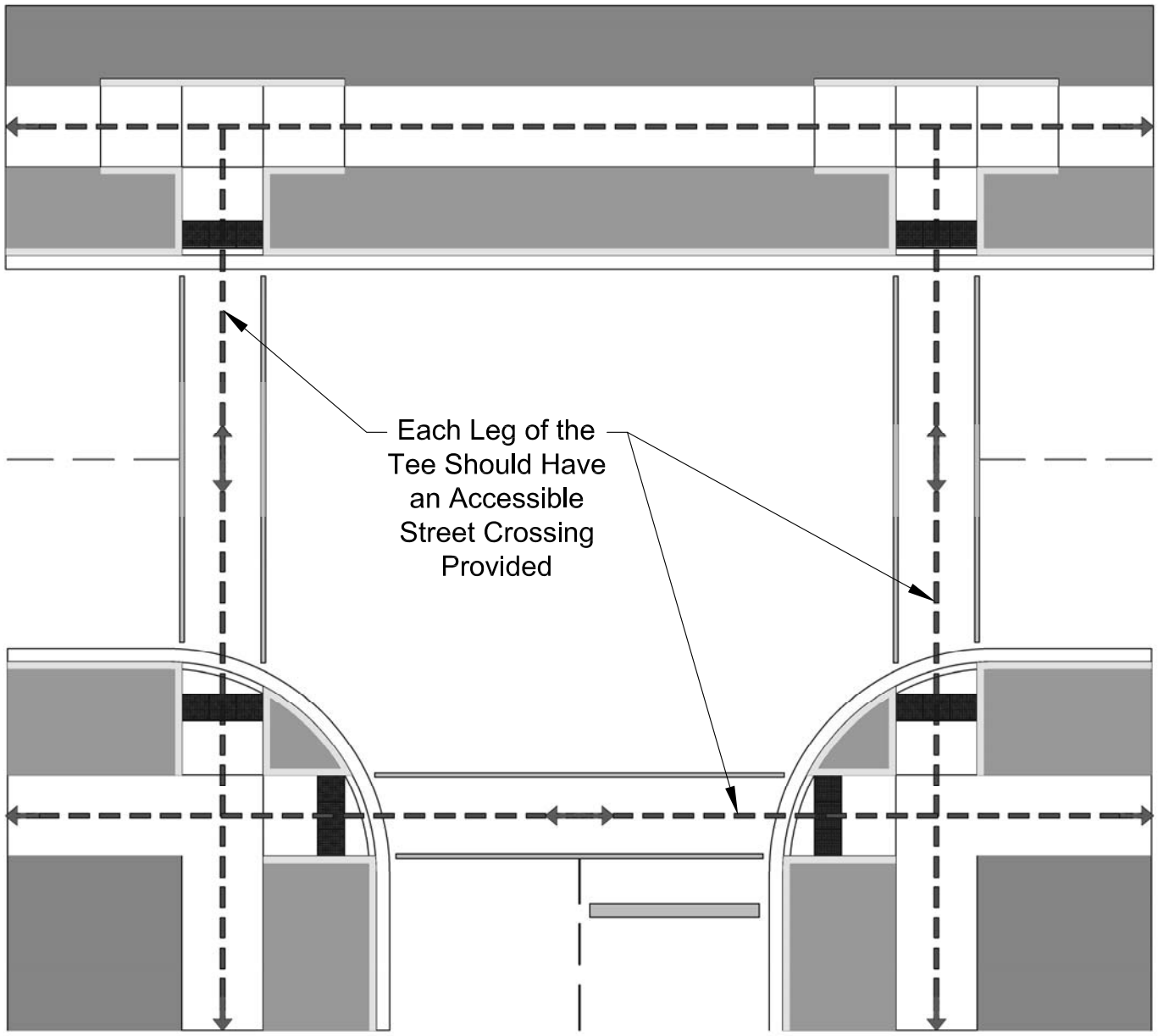


Figure 5.6.1 (Tee Intersections)

5.6.2 Maintaining or Removing Crossings

In the interest of pedestrian safety or as a result of sound engineering judgement, it may be determined that a crossing should not be provided at a leg of a tee intersection. However, **at least one crossing must remain** and an existing crossing should not be removed as it may be construed as a reduction of access, which is not permitted. (Figure 5.6.2)

Where no crossing currently exists, the possibility of providing an accessible street crossing at that location should be reviewed.

Street crossings that must remain closed or are planned to be for safety or other reasons **must be closed to all pedestrians**, not just pedestrians that rely on curb ramps; **closed crossings must provide that information to all pedestrians, including those with visual impairments.**

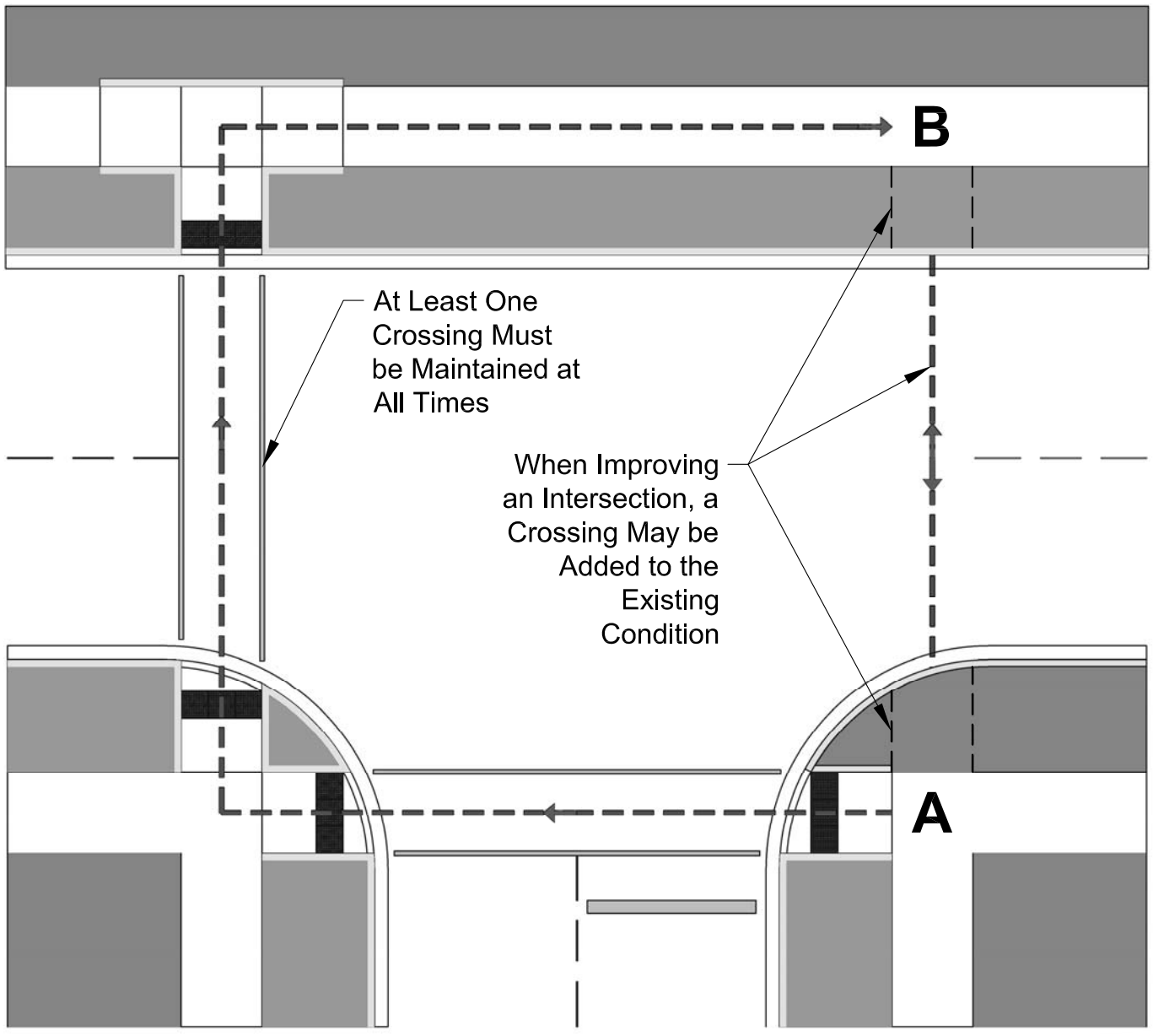


Figure 5.6.2 (Tee Intersections)

5.6.2 Maintaining or Removing Crossings (cont.)

At some locations, the existing tee intersection layout is not reflective of current acceptable accessible design. A curb ramp may lead into a street crossing that is opposed by a driveway on the other side. Because a driveway is intended to serve vehicular traffic, it is not considered to be part of the accessible pedestrian way. While arguably usable at times for pedestrians, it is not advisable that pedestrian traffic be encouraged to use driveways, particularly in more heavily trafficked areas.

Driveways cannot be considered as a curb ramp and if a safe and accessible street crossing cannot be provided, the crossing should be closed to all pedestrians. (Figure 5.6.3)

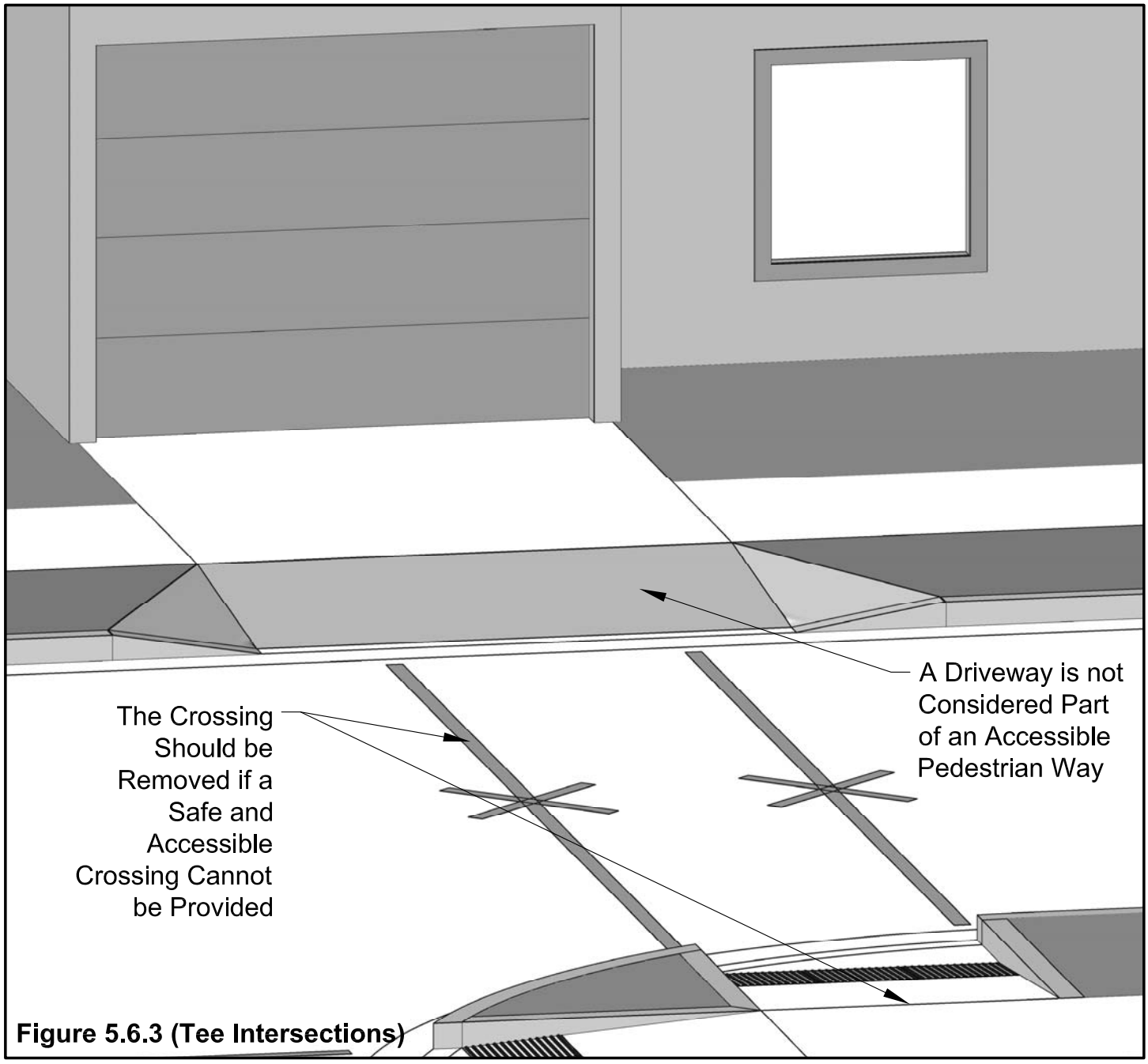


Figure 5.6.3 (Tee Intersections)

5.6.2 Maintaining or Removing Crossings (cont.)

If a bus stop is situated too far into the tee intersection, it will not be safe or practical to maintain a pedestrian street crossing at this location. A pedestrian using a mobility assistive device attempting a street crossing requires a curb ramp to access the sidewalk elevation.

Conversely, a pedestrian being deployed from a bus that requires services of the bus lift needs to be lowered onto sidewalk level. A curb ramp situated at this deployment zone could create a difficult or otherwise inaccessible situation for those unloading from the bus. Refer to Section 8.2.4 for requirements at bus stop loading areas. (Figure 5.6.4)

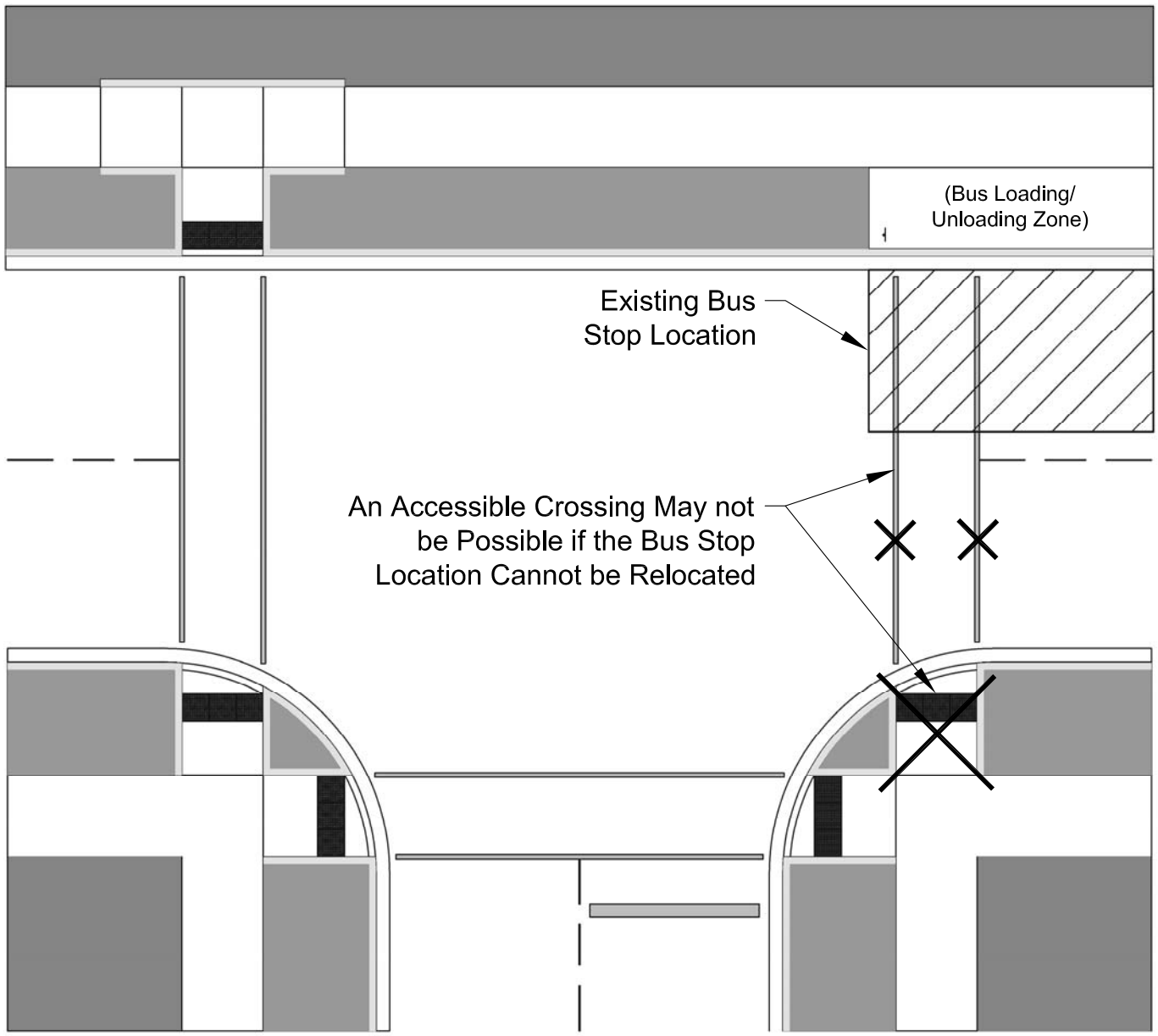


Figure 5.6.4 (Tee Intersections)

5.6.2 Maintaining or Removing Crossings (cont.)

Intersection geometry might also raise questions regarding the safety levels of existing or proposed street crossings. One example is where many tee intersections intersect an arterial or collector street and the tees are offset from one another. (Figure 5.6.5)

Existing traffic movements may compromise pedestrian safety, and consideration may be given to closing a street crossing to pedestrians. An analysis of the flow of traffic versus pedestrian movements should be conducted to determine if crossings should be removed.

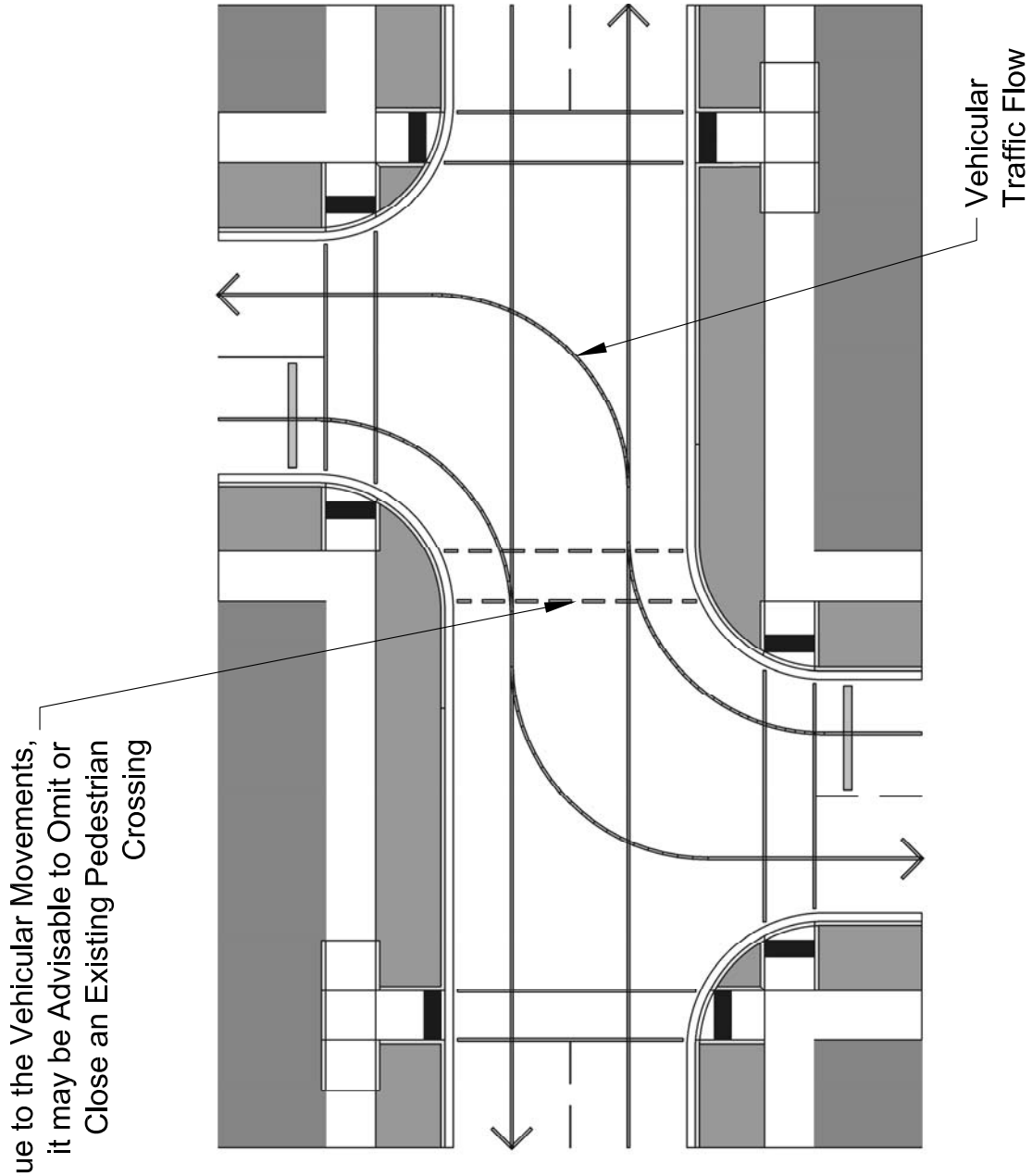


Figure 5.6.5 (Tee Intersections)

5.7 Accessible Street Crossings - Accessible Pedestrian Pushbuttons

Pedestrian Actuated Pushbuttons

If a street crossing pedestrian signal requires pushbutton actuation, the pushbutton must be in an accessible location. (Figures 5.7.1) Refer to Figures 5.7.2, 5.7.3 (next page) for pushbutton location requirements as related to curb ramp locations.

Location Requirements per PROWAG:

- Clear Space: An unobstructed clear area with a cross slope of 2% maximum in any direction must be provided for a minimum of 30 inches by 48 inches adjacent to the pushbutton or operable part. The orientation of the clear space can be positioned parallel or perpendicular (forward) to the object.

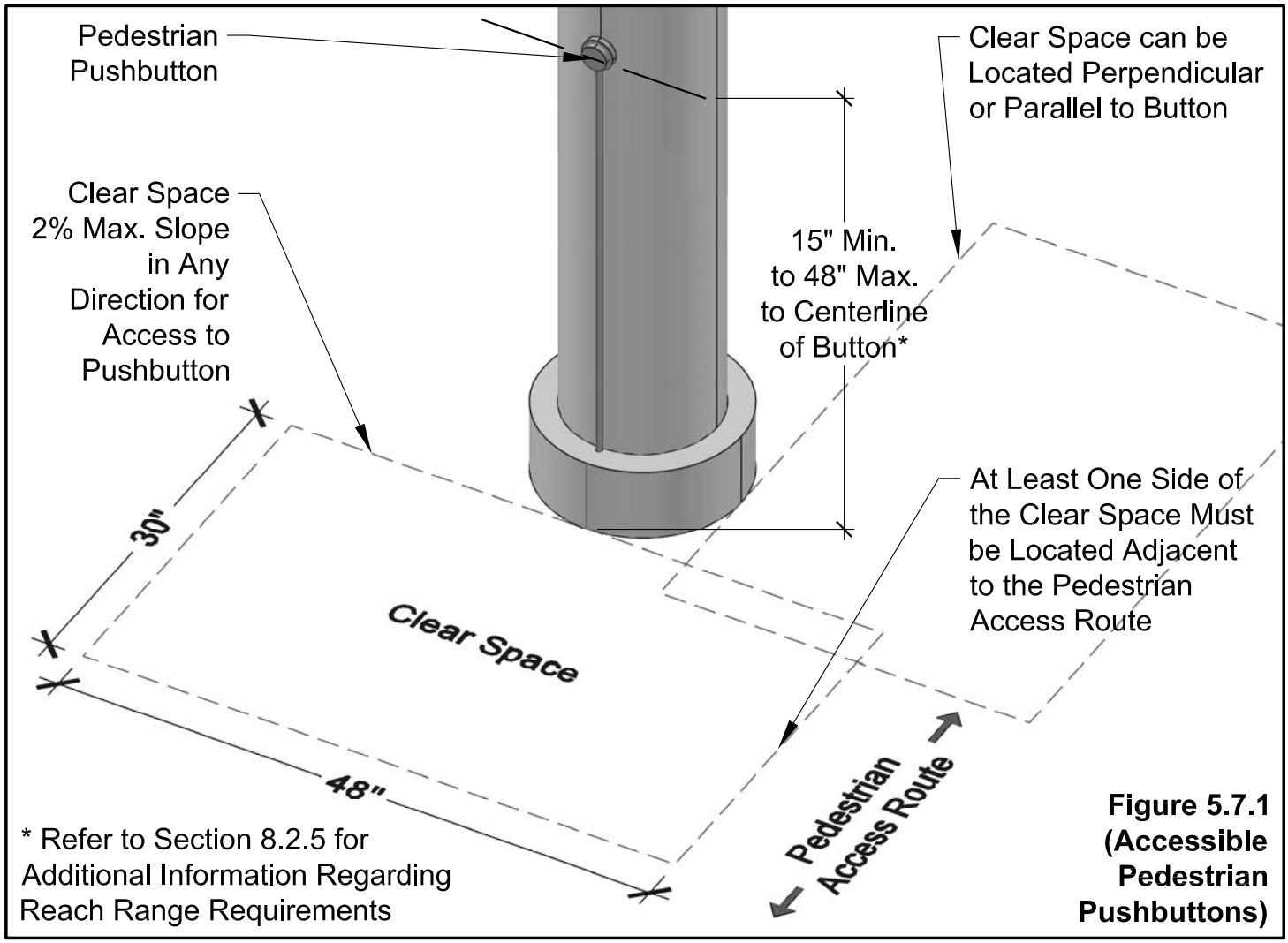
- Approach: One full unobstructed side of the clear space shall adjoin a pedestrian access route or adjoin another clear space.

- Approach: One full unobstructed side of the clear space shall adjoin a pedestrian access route or adjoin another clear space.

- Reach Height Range: The pushbutton must be located at 15 inches minimum to 48 inches maximum height above the ground surface to the centerline of the button.

- Operation: Operable parts shall be operable with one hand and shall not require tight grasping, excessive pinching, or twisting of the wrist. The force required to activate the operable parts shall be 5 pounds maximum.

- Size & Contrast (Pushbutton Only): Pushbuttons shall be a minimum of 2 inches across in one dimension and shall contrast visually with their housing or mounting.



* Refer to Section 8.2.5 for Additional Information Regarding Reach Range Requirements

Figure 5.7.1 (Accessible Pedestrian Pushbuttons)

5.7 Accessible Street Crossings - Accessible Pedestrian Pushbuttons

Where pedestrian pushbuttons are necessary, location must be considered in relationship to the adjacent curb ramps and other elements located at the crossing. The button should be accessible from the ramp landing and/or the pedestrian access route within the required reach range (refer to Section 8.2.5 for additional information). **The button must not be located where accessible only from the surface of the ramp**; a person in a wheelchair would be be forced to hold position on a ramp with one hand while reaching for a pushbutton with the other hand. If necessary, a stub pole or post could be provided to mount the pushbutton in an accessible location where an existing signal pole cannot be relocated.

The face of the pushbutton must be oriented parallel to the crossing that it serves.

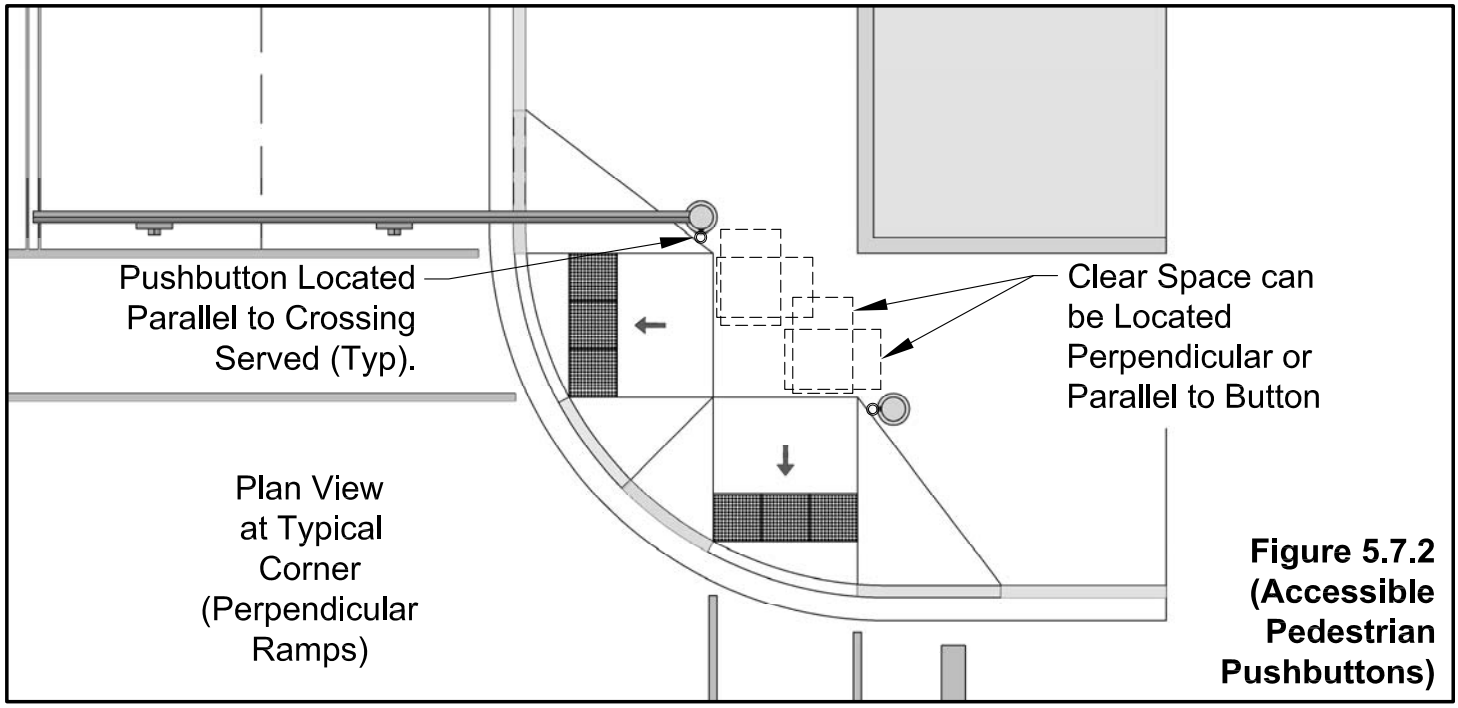


Figure 5.7.2 (Accessible Pedestrian Pushbuttons)

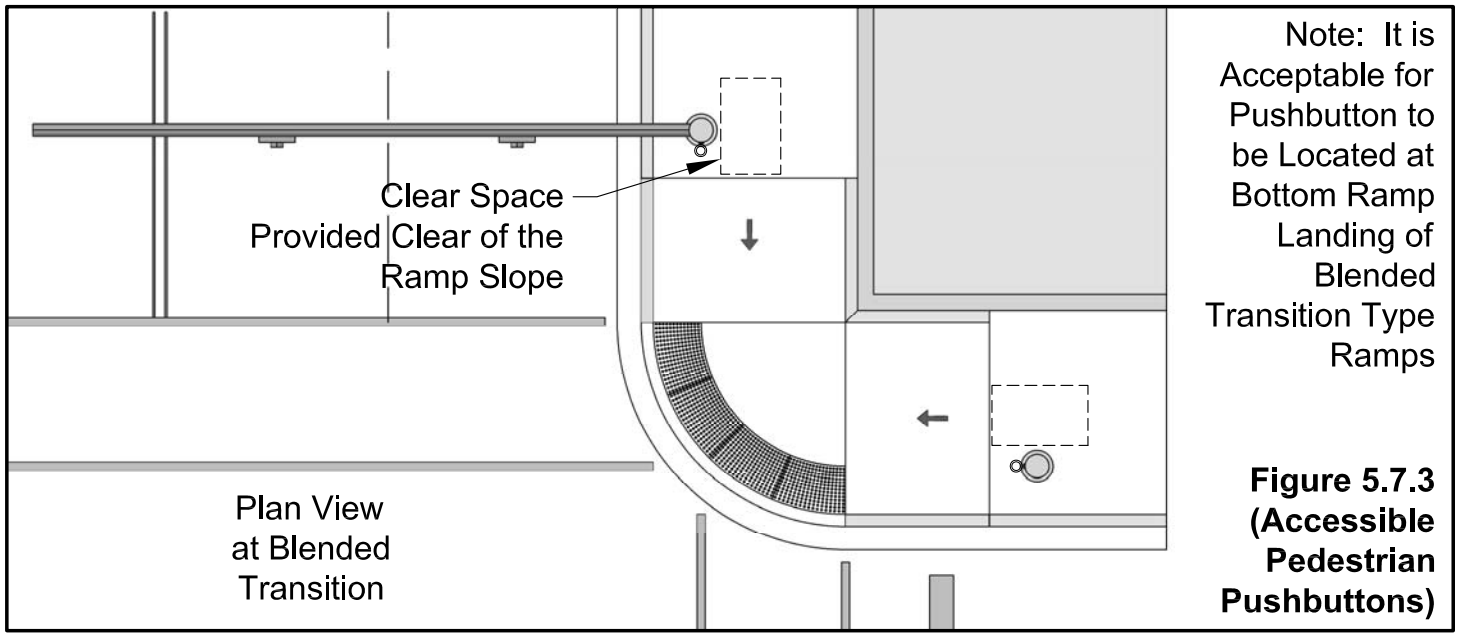


Figure 5.7.3 (Accessible Pedestrian Pushbuttons)

Refer to Section 8.2.5 for Additional Information Regarding Reach Range Requirements

5.8 Accessible Street Crossings - Accessible Pedestrian Signals

Note: This Section on accessible pedestrian signals (APS) is intended for informational purposes only; the City of Chicago is currently in the process of researching the APS technologies available, determining methods to prioritize the needs for APS, and obtaining feedback and guidance from the blind community before proceeding with any policies regarding APS.

5.8.1 Overview

An accessible pedestrian signal (APS) system is designed primarily to provide appropriate street crossing information to pedestrians with vision impairments. The key ingredient to an APS system is an audible street crossing indicator, signaling safe crossing time to the pedestrian. This audible signal acts as a WALK or DON'T WALK sign to those with vision impairments that others are able to see when looking at the pedestrian signal head. Blind pedestrians use different cues when negotiating the public way and when performing street crossings. Tactile features and the sound of surging traffic are indicators of crossing orientation and timing. Engineers and construction professionals should be working closely with the blind community to better determine their needs and to discuss engineering concerns.

Prioritizing Installation Locations

While APS could potentially be beneficial at many intersections, it is important to realize that the blind pedestrian population could readily benefit from the installation of APS in a number of different locations that may be unsafe, difficult to use, or may be an area with a high priority for blind pedestrians. For example:

- Intersections with pedestrian actuated signal timing: A blind pedestrian may wait for a traffic surge, not knowing that pedestrian actuation using a pushbutton is required.
- Intersections with high levels of ambient noise: High levels of noise, such as the elevated train overhead, can mask the sound of the cue of the traffic surges that blind pedestrians may rely on.
- Intersections with complex geometry: It may not be clear the orientation or direction of crossing to the blind pedestrian.
- Intersections with complex traffic signal phasing: Protected turns and other complex signals may be confusing for the blind pedestrian to establish appropriate crossing time.
- Intersections located near medical or institutional facilities: Hospital campuses may have a high volume of blind pedestrians.
- Intersections located near facilities for the blind.
- Intersections located in generally high pedestrian volume areas.
- Intersections with multiple requests for APS installation.

There are many available tools in helping to determine priority areas for installing APS systems. The U.S. Access Board has published *Accessible Pedestrian Signals*, which goes into great depth regarding technologies available, case studies, prioritization tools, and much more helpful information in understanding these systems. This publication can be found at *www.walkinginfo.org*.

APS Technologies

Although different technologies are available, it is important to provide consistency from one intersection to the next; if each intersection had a different type of technology, it would become very confusing for those with visual impairments. Varying sounds produced or inconsistent pushbutton location could result in an unusable network.

(Continued to Next Page)

5.8.1 Overview (cont.)

APS Technologies (cont.)

The following technologies are currently available that provide a number of different audible cues and vibration features to assist with street crossings to not only those with vision impairments, but also may also be helpful to those with hearing impairments:

- Pedhead-Mounted: Speakers mounted in, on or near the visible pedestrian signal head.
- Pushbutton-Integrated: Audible tones, speech, or vibrating hardware integrated into the pedestrian pushbutton.
- Vibrotactile-Only: WALK information only provided by vibrotactile indication at the pushbutton location.
- Receiver-Based: Infrared transmitters mounted in or on pedestrian signal heads that provide speech messages at personal receivers, or LED pedestrian signal heads that pulse to transmit a code to call up a speech or vibrotactile message at personal receivers.

Although not currently enforceable, PROWAG requires that when traffic signals are newly installed or altered, APS must be provided. PROWAG requires that all signals provide both vibrotactile and audible indications. Refer to Section 5.8.2 for additional information on these requirements.

Again, refer to the Access Board publication *Accessible Pedestrian Signals* for much more helpful information in understanding these systems. This publication can be found at *www.walkinginfo.org*.

Setbacks

Within the past twenty years, there have been various types of audible pedestrian signals installed in different areas of the country. The APS effort is a bit of a moving target; research is ongoing to determine the most effective technology and the best ways to prioritize the installations of these systems. The blind community is not always unanimous in their support of APS or a specific technology available.

Additionally, some communities have provided negative feedback to the systems due to the noise pollution added to the environment. Technologies are available that have volume adjustment capabilities due to the ambient noise at the intersection, but the systems may not be perfect and resistance may be inevitable.

In Chicago, most of the intersections are not pedestrian actuated, and this has been the root of one of the concerns. The pedestrian actuation can have a dramatic effect on the traffic patterns, and the pushbutton located at the intersections can affect the design of the curb ramps and sidewalks in an already crowded zone. Research and testing is ongoing to find the best solution to APS and the most practical way to apply it. The City hopes to couple the APS effort with the accessible curb ramp and sidewalk installations to provide a truly accessible network.

5.8.2 Proposed Requirements

Although APS in the United States is a work in progress, the U.S. Access Board and the FHWA have both put forward advisement regarding the implementation of APS systems. While there are currently no enforceable requirements to install APS systems, municipalities like Chicago are encouraged to investigate the need for APS to make pedestrian travel more safe for those with vision and/or hearing impairments. The following are the requirements for APS as proposed by PROWAG:

Pedestrian Signals

- Each crosswalk with pedestrian signal indication shall have an accessible signal which includes audible and vibrotactile indications of the WALK interval. Where a pedestrian pushbutton is provided, it shall be integrated into the accessible pedestrian signal.

Advisory: Signals should generally sound and vibrate throughout the WALK interval. Where signals rest in WALK, audible operation may be limited to a repetition at short intervals rather than continuous sounding for several minutes.

Pedestrian Signal Location

- Accessible pedestrian signals shall be located so that the vibrotactile feature can be contacted from the level landing serving a curb ramp, if provided, or from a clear ground space that is in line with the crosswalk line adjacent to the vehicle stop line.

Crossings

- Accessible pedestrian signal devices shall be 10 feet minimum from other accessible pedestrian signals at a crossing. The control face of the accessible pedestrian signal shall be installed to face the intersection and be parallel to the direction of the crosswalk it serves.

Medians and Islands

- Accessible pedestrian signals located in medians and islands shall be 5 feet minimum from other accessible pedestrian signals.

Reach & Clear Floor or Ground Space

- A clear floor or ground space shall be provided at the pushbutton and shall connect to or overlap the pedestrian access route (refer to Section 5.7 for additional information).

Audible Walk Indication

- The audible indication of the WALK interval shall be tone or speech message.

Tones

- Tones shall consist of multiple frequencies with a dominant component at 880 Hz. The duration of the tone shall be 0.15 s and shall repeat at intervals of 0.15 s.

Advisory: Many new accessible pedestrian signal installations in the U.S. use speech messages, which are perceived as being more user-friendly than tones. However, such messages may not be intelligible under high-ambient-noise conditions or to non-English speakers. Electronic tones are more universal and unambiguous. Section 4E.06 of the MUTCD specifies content of speech messages.

Volume

- Tone or voice volume measured at 3 feet from the pedestrian signal device shall be 2 dB minimum and 5 dB maximum above ambient noise level in standard operation and shall be responsive to ambient noise level changes.

Advisory: Where additional volume or beaconing features are available on pedestrian activation, they will momentarily exceed volume limits.

Pedestrian Pushbuttons

- Where a pedestrian pushbutton is provided, it shall be integrated into the accessible pedestrian signal (and comply with the requirements of accessible pedestrian signals).

(Continued to Next Page)

5.8.2 Proposed Requirements (cont.)

Pushbutton Locator Tone

- Pedestrian pushbuttons shall incorporate a locator tone at the pushbutton. Pushbutton locator tone volume measured at 3 feet from the pushbutton shall be 2 dB minimum and 5 dB maximum above ambient noise level and shall be responsive to ambient noise level changes. The duration of the locator tone shall be 0.15 s maximum and shall repeat at intervals of one second. The locator tone shall operate during the DON'T WALK and flash DON'T WALK intervals only and shall be deactivated when the pedestrian signal is not operative.

Size & Contrast

- Pedestrian pushbuttons shall be a minimum of 2 inches across in one direction and shall contrast visually with their housing or mounting.

Optional Features

- An extended button press shall be permitted to activate additional features. Buttons that provide additional features shall be marked with three Braille dots forming an equilateral triangle in the center of the pushbutton.

Directional Information and Signs

- Pedestrian signal devices shall provide tactile and visual signs complying with (see following requirements) on the face of the device or its housing or mounting to indicate crosswalk direction and the name of the street containing the crosswalk served by the pedestrian signal.

Arrow

- Signs shall include a tactile arrow aligned parallel to the crosswalk direction. The arrow shall be raised .03 inches minimum and shall be 1.5 inches minimum in length. The arrowhead shall be open at 45 degrees to the shaft and shall be 33% of the length of the shaft. Stroke width shall be 10% minimum and 15% maximum of arrow length. The arrow shall contrast with the background.

Street Name

- Accessible pedestrian signals shall include street name information aligned parallel to the crosswalk direction and shall comply with (see note below) or shall provide street name information in audible format.

Note: Refer to Braille requirements in ADAAG or PROWAG for additional information.

Crosswalk Configuration

- Where provided, graphic indication of crosswalk configuration shall be tactile.

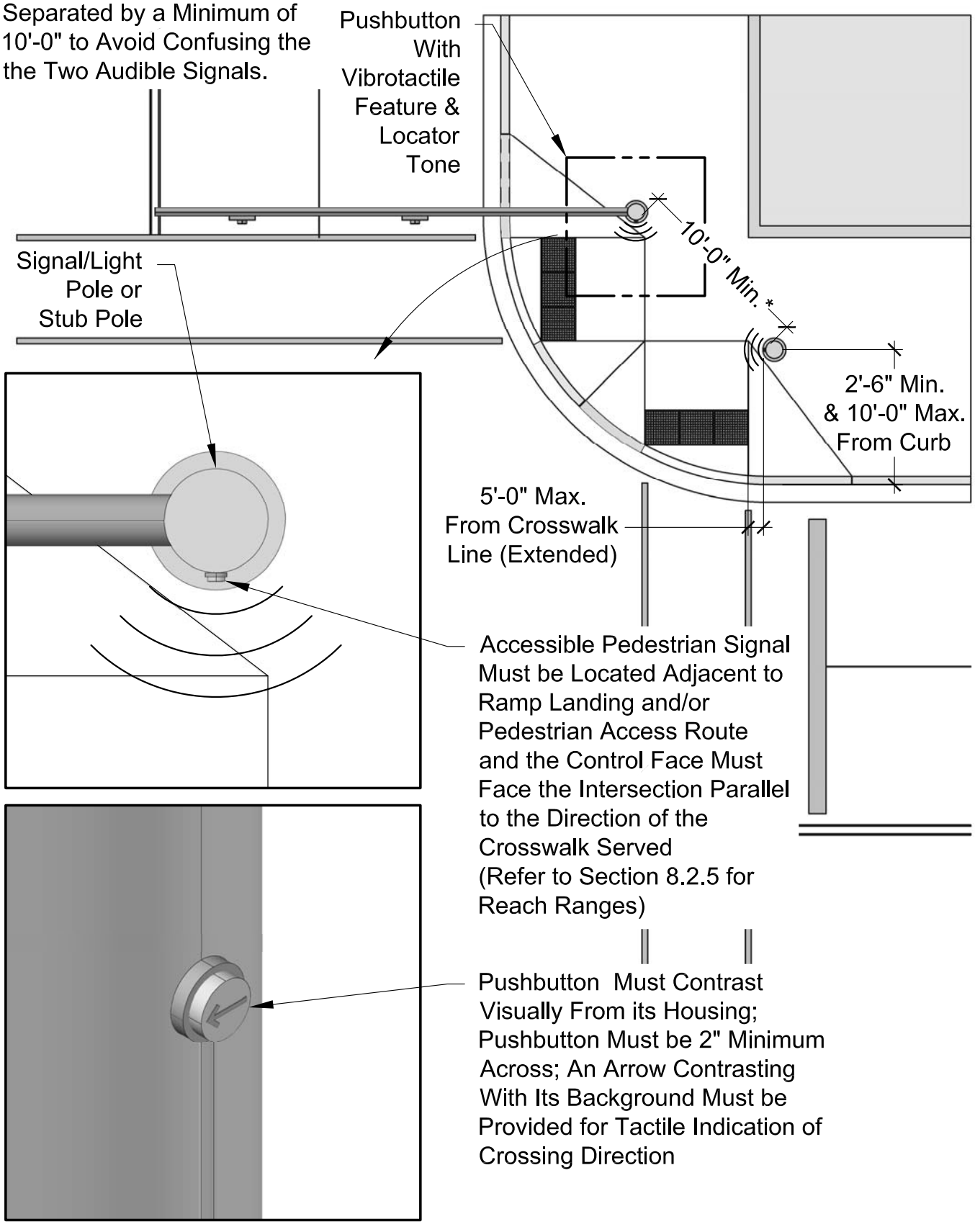
5.8.3 Placement for Pushbutton-Integrated APS

Refer to Figure 5.8.1, next page, for a graphic depiction of APS location requirements.

Refer to Figure 5.7.1, page 106, for additional pushbutton requirements, including mounting height and clear space for access to the button.

5.8.3 Placement for Pushbutton-Integrated APS

Figure 5.8.1 (APS)



6.0 Alleys & Driveways

6.1 Alleys and Driveways - Overview

Where a sidewalk intersects an alley or a driveway, the pedestrian crossing must be acknowledged and this crossing must be made accessible to those pedestrians with disabilities.

There are three fundamental alley and driveway designs where pedestrian crossings may be necessary:
- Alley Returns (Figure 6.1.1)
- Driveways With Flares (Figure 6.1.2)
- Commercial Driveways With Curb Returns (Figure 6.1.3)

The pedestrian access route must be provided with a 6 foot preferred width (4 feet minimum) across the alley or driveway, with a flush connection to the sidewalk at both sides of the crossing. It is not required that a ramp provide the connection from the sidewalk to the crossing if the elevations of the two surfaces are equivalent. The crossings must satisfy all of the requirements of an accessible route, including running and cross slopes. (Figure 6.1.4, next page).

Note: Driveways with curb returns are only to be used in accordance with traffic signalization approved by City ordinance.

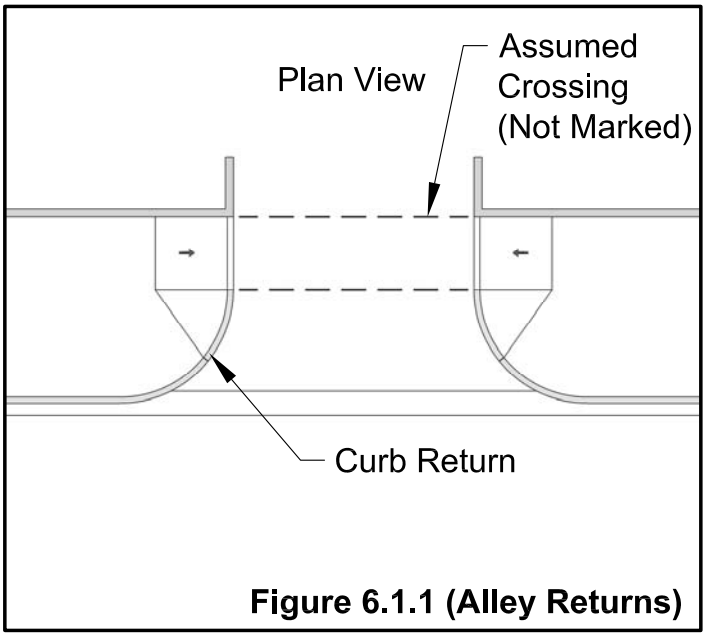


Figure 6.1.1 (Alley Returns)

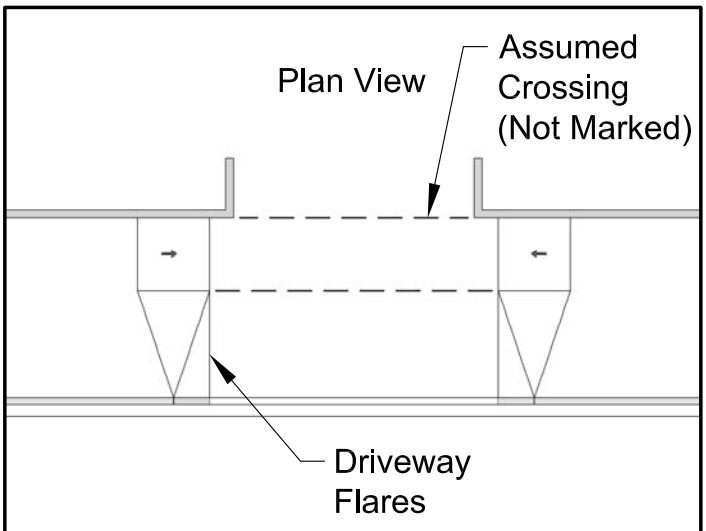


Figure 6.1.2 (Driveway With Flares)

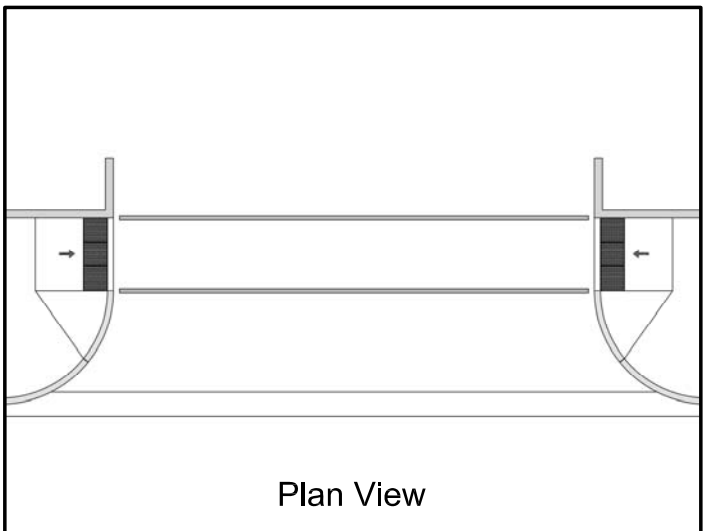


Figure 6.1.3 (Driveway With Curbs)

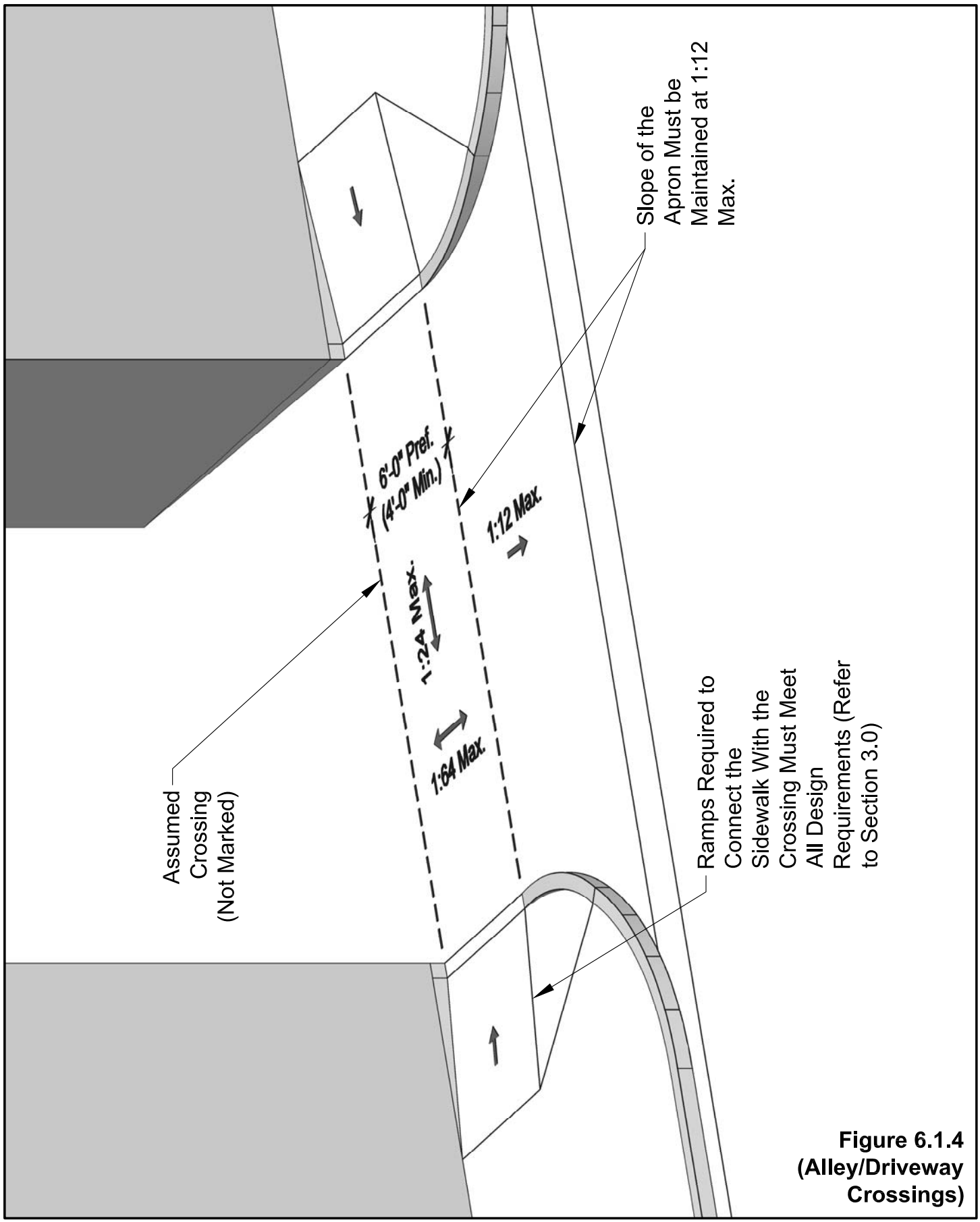


Figure 6.1.4 (Alley/Driveway Crossings)

6.1 Alleys and Driveways - Overview (cont.)

Regardless of the alley or driveway configuration the accessible route must be clear of the flares of a driveway or the curb returns.

Ideally, the alley or driveway can ramp up to the desired elevation, with room left available for the pedestrian crossing aligned with the mainline sidewalk, whether located at full width sidewalks or adjacent to landscaped parkways. (Figure 6.1.5)

However, if the transition from the street to the top of the alley or driveway requires more width than the available sidewalk width can provide, alternate designs may be necessary. This may include a pedestrian crossing at the curb line or behind the top of the driveway. (Figures 6.1.6, 6.1.7)

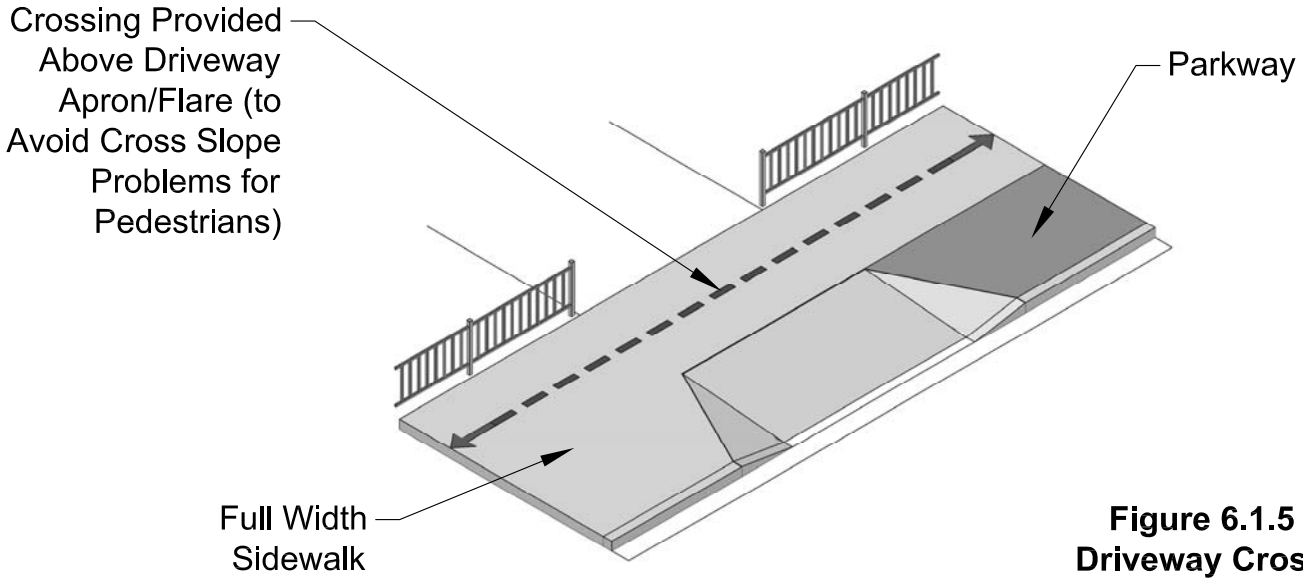


Figure 6.1.5 (Alley/ Driveway Crossings)

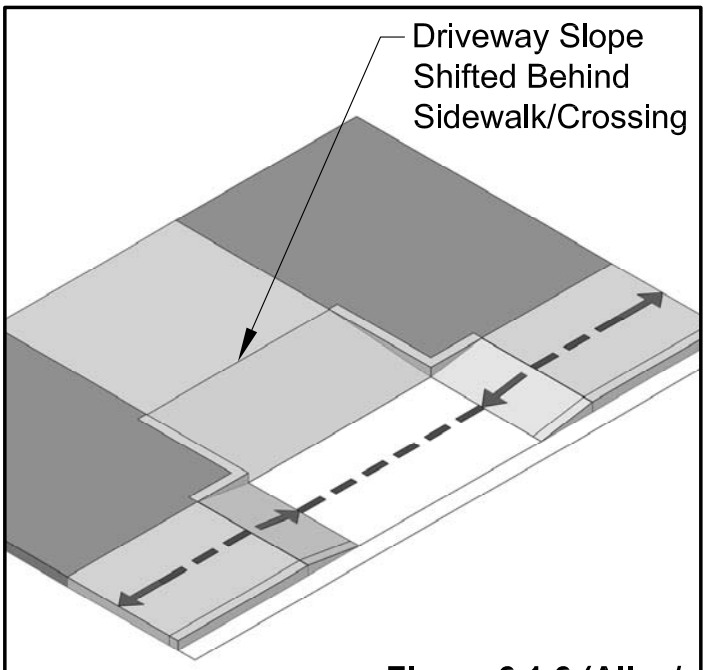


Figure 6.1.6 (Alley/ Driveway Crossings)

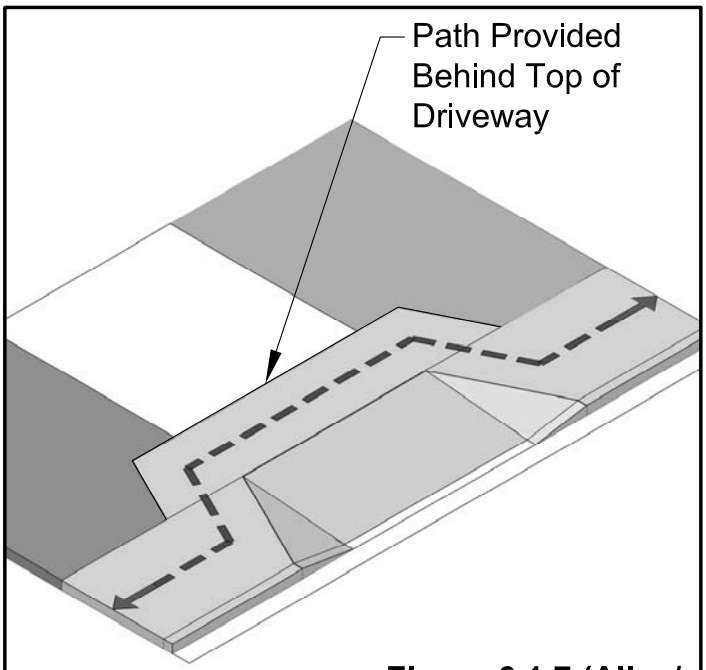


Figure 6.1.7 (Alley/ Driveway Crossings)

6.2 Alleys & Driveways - Alleys

Typically alleys include curb returns and do not include the flared sides seen in driveway details.

While an accessible alley crossing must be provided, detectable warnings are not to be placed at pedestrian crossings at alleys. (Figure 6.2.1)

If the mainline sidewalks are offset from one side of the alley to the other, an accessible route must connect the two while adhering to the typical slope and width requirements. This skew or angled crossing will provide the highest level of accessibility possible under the circumstances. (Figure 6.2.2)

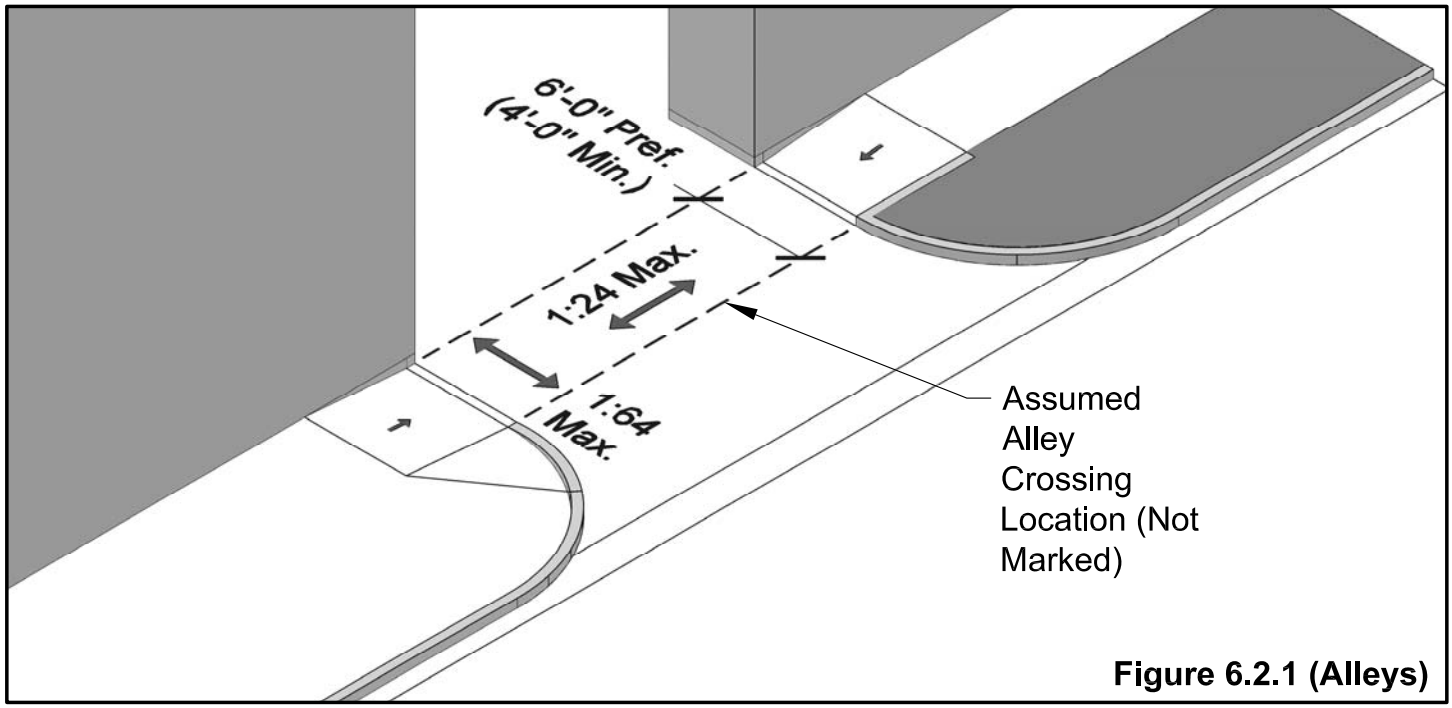


Figure 6.2.1 (Alleys)

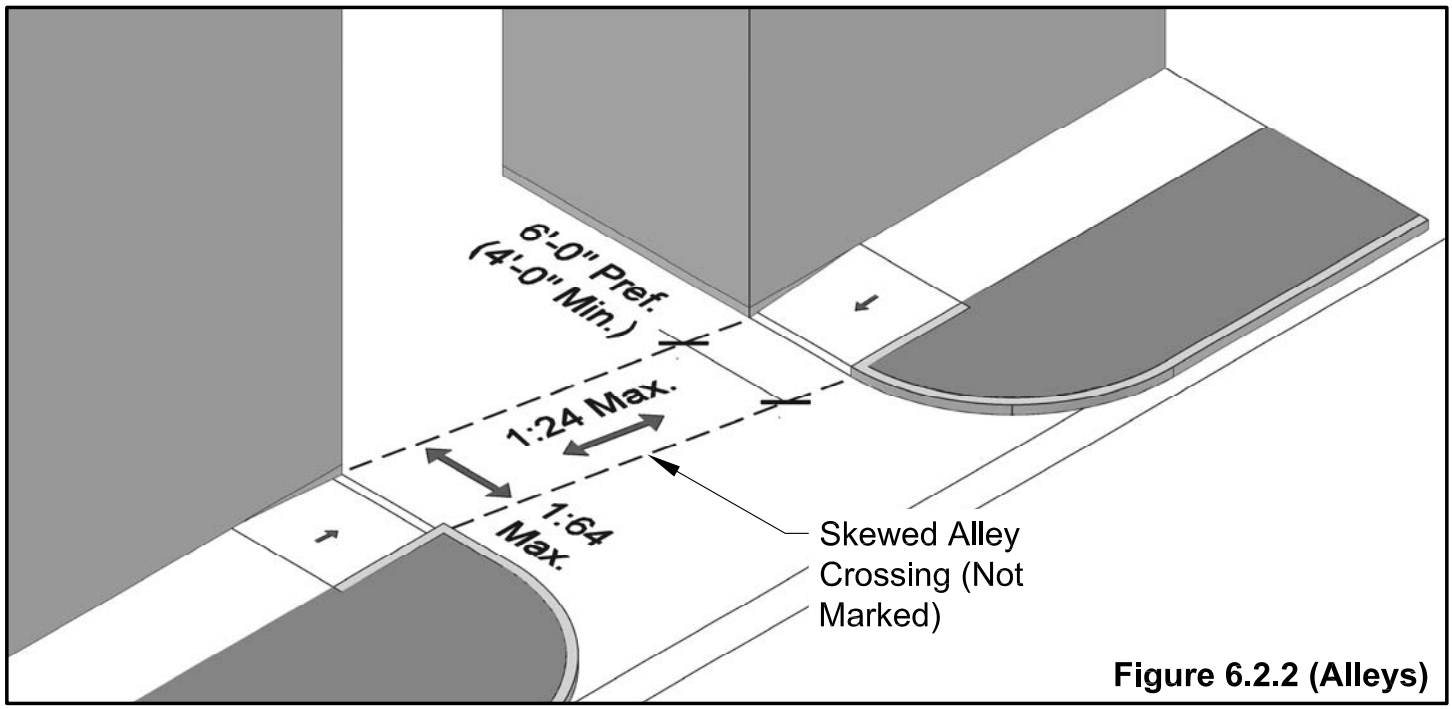


Figure 6.2.2 (Alleys)

6.3 Alleys & Driveways - Driveways

6.3.1 Driveways With Flares

Typically driveways include flared sides and do not include curb returns.

While an accessible driveway crossing must be provided detectable warnings are not to be placed at pedestrian crossings at driveways. (Figure 6.3.1)

6.3.2 Driveways With Curbs (Signalized)

Signalized, commercial driveways* typically include curb returns.

An accessible driveway crossing must be provided and detectable warnings must be placed at pedestrian crossings at signalized, commercial driveways.* (Figure 6.3.2)

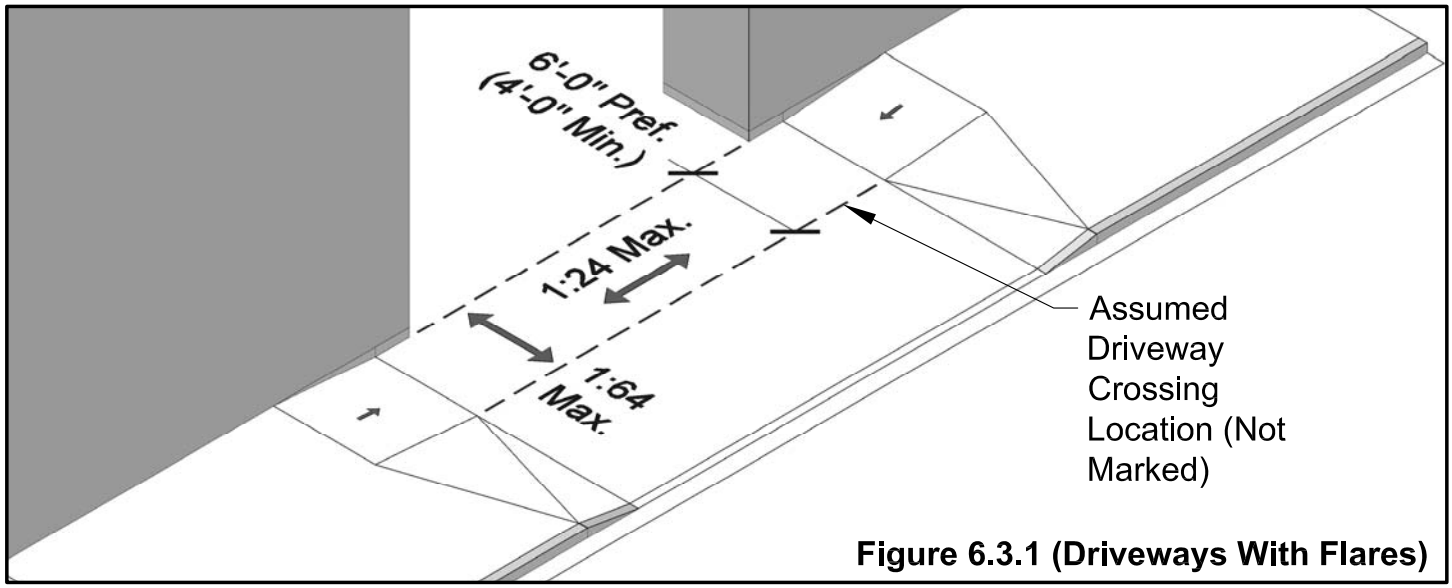


Figure 6.3.1 (Driveways With Flares)

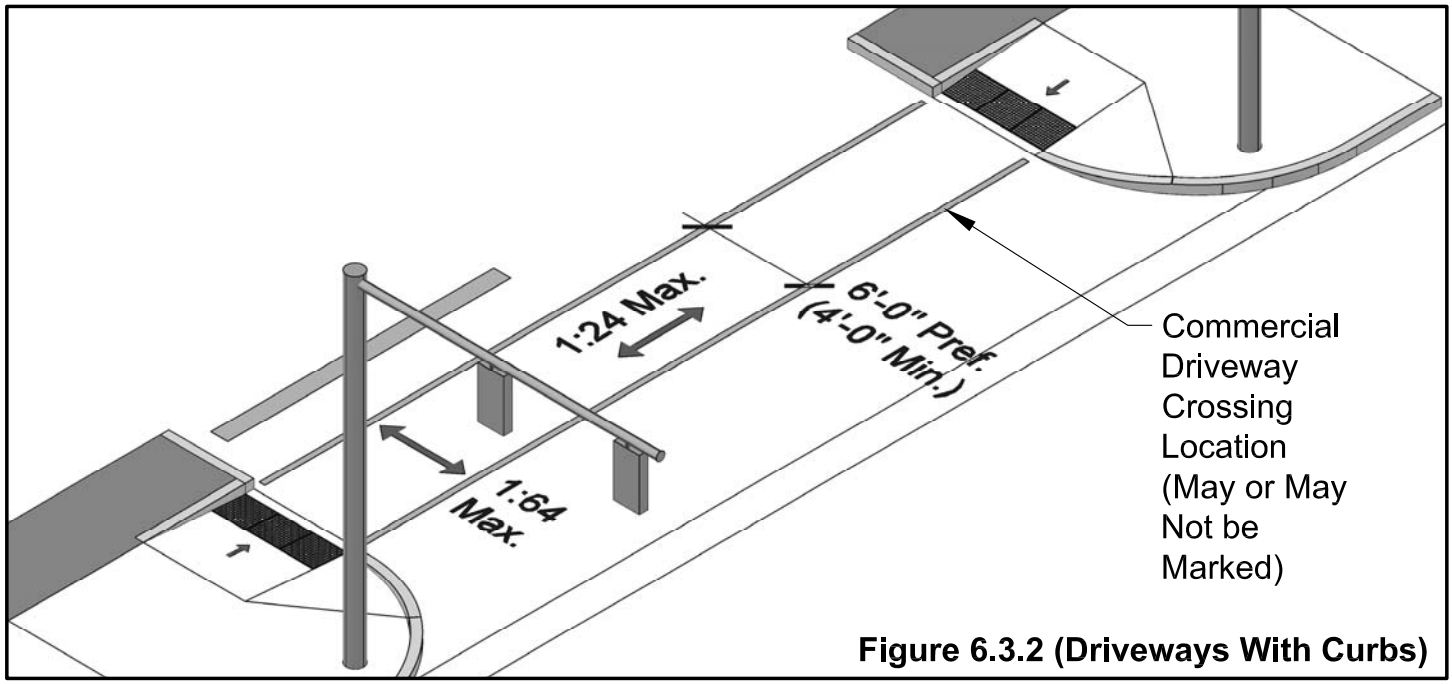


Figure 6.3.2 (Driveways With Curbs)

* Driveways with curbs are only to be used in accordance with traffic signalization approved by City ordinance.

7.0 Parking & Drop-Offs

7.1 Parking & Drop-Offs - Accessible On-Street Parking

On-street parking is common in urban areas and with it comes an obligation to provide parking that is accessible to those with disabilities.

Because Title II of the ADA requires equivalent program access for those with disabilities, it is important to carefully analyze the placement of accessible on-street parking. It would be ideal to place the accessible parking space at the end of the block where the curb ramps providing access at the corner up to the sidewalk would facilitate a pedestrian with a mobility impairment. (Figure 7.1.1, next page)

Other factors must be considered as well. An accessible parking space should be located where street slopes allow for the disabled that alight from a vehicle on the street side the best opportunity to safely situate themselves in or on their mobility assistive device. For those that alight on the curb side, the parking space must be free and clear of any barriers that would prevent or make unloading difficult. These kind of barriers could include but are not limited to planter boxes, tree pits, fences, poles, etc. Curb ramps may also be considered obstructions for those alighting from the passenger side of a vehicle. It is preferred that the unloading occur directly at the sidewalk elevation. (Figure 7.1.1, next page)

According to PROWAG, where on-street parking is marked or metered, accessible parking spaces must be provided in accordance with the following table:

Total # of Parking Spaces on the Block Perimeter	Min. # of Required Accessible Parking Spaces
1 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 and over	4% of total

Accessible Parking Signage

Standard accessible parking signs are required to be installed at the accessible parking space locations. The International Symbol of Accessibility must be displayed on the sign.

Remote Parking Meters

Where a centralized collection box is used for parking payment, it must be connected to a pedestrian access route. Displays and information shall be visible from a point located 3 foot, 4 inches maximum above the clear space in front of the meter. Refer to Section 8.2.5 for additional information regarding clear space required.

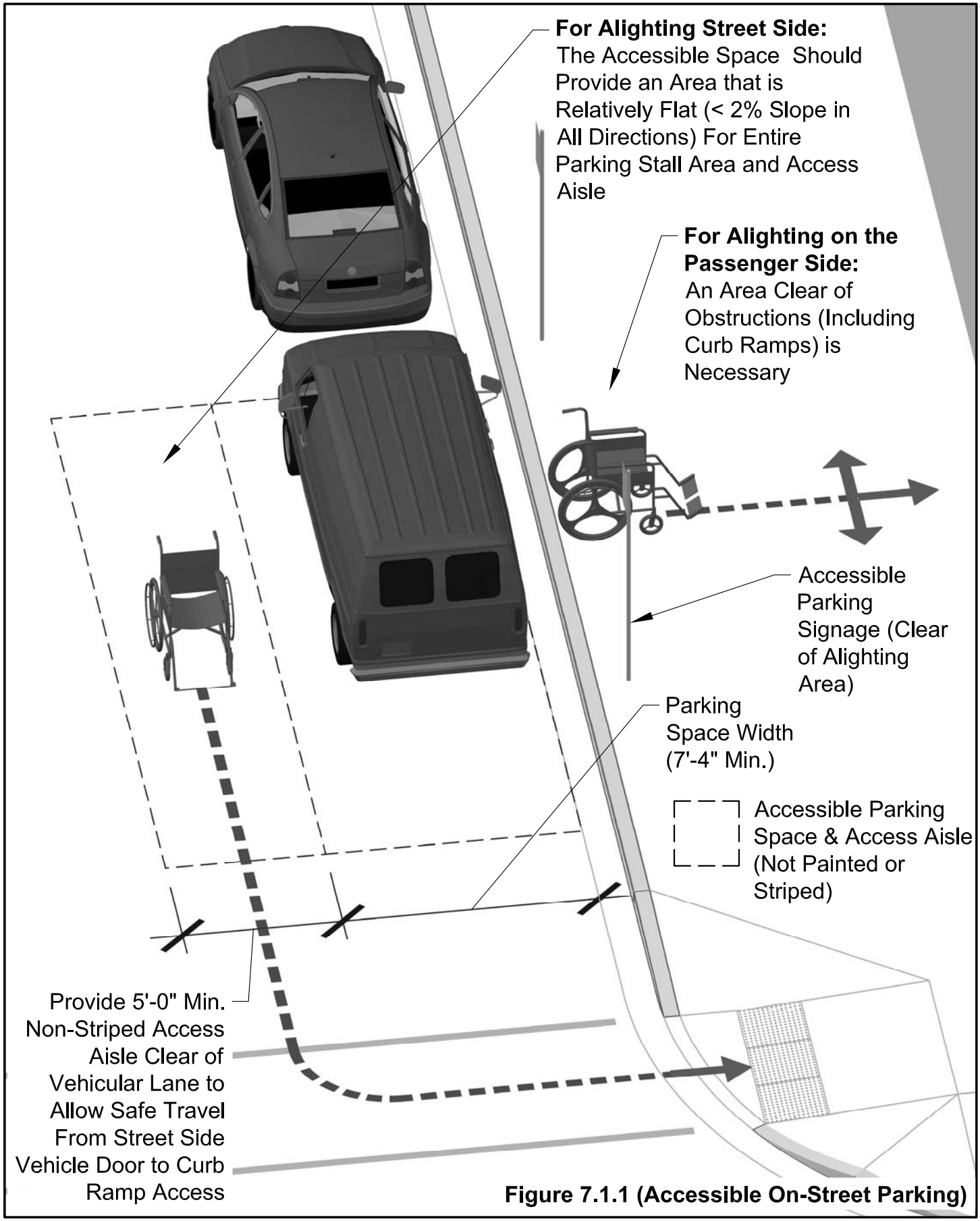


Figure 7.1.1 (Accessible On-Street Parking)

In addition to the quantity of accessible parking spaces to be provided per block perimeter, PROWAG includes the following requirements and advisements regarding on-street accessible parking at wide sidewalks that are available to facilitate van deployment:

Wide Walkways

Where the sidewalk adjacent to the accessible parking space exceeds 14 feet, a 5 foot minimum width access aisle shall be provided at street level for the full length of the parking space. The access aisle shall connect to the pedestrian access route, by means of curb ramp* if necessary (refer to Section 3.0 for curb ramp requirements). The access aisle shall not encroach on the vehicular travel lane.
Advisory: The walkways adjacent to an accessible parallel parking space should be free of obstructions such as signage, plantings, or equipment that would preclude deployment of a vehicle side-lift onto the access aisle or walkway. A vehicle may park at the curb or at the parking lane boundary in order to locate the access aisle for individual use.

Note: The existing wide sidewalk allows sufficient room for the access aisle to be located away from the vehicular travel lane as well as the required sidewalk width (remaining) for typical curb ramp installation up to the pedestrian way. (Figure 7.1.2)

Refer to Section 7.2 for additional information regarding passenger loading zones/drop-offs with street level access aisles.

Narrow Walkways

Access aisles are not required where the adjacent sidewalk is less than or equal to 14 feet. When an access aisle cannot be provided, the accessible parking space must be located at the end of the block. (Figure 7.1.1)
Advisory: An end-of-block space can be served by the curb ramps at the street crossing.

* Curb ramps not leading into a street crossing or hazardous way should not have a detectable warning surface which could mistakenly suggest a street crossing to the blind or visually impaired.

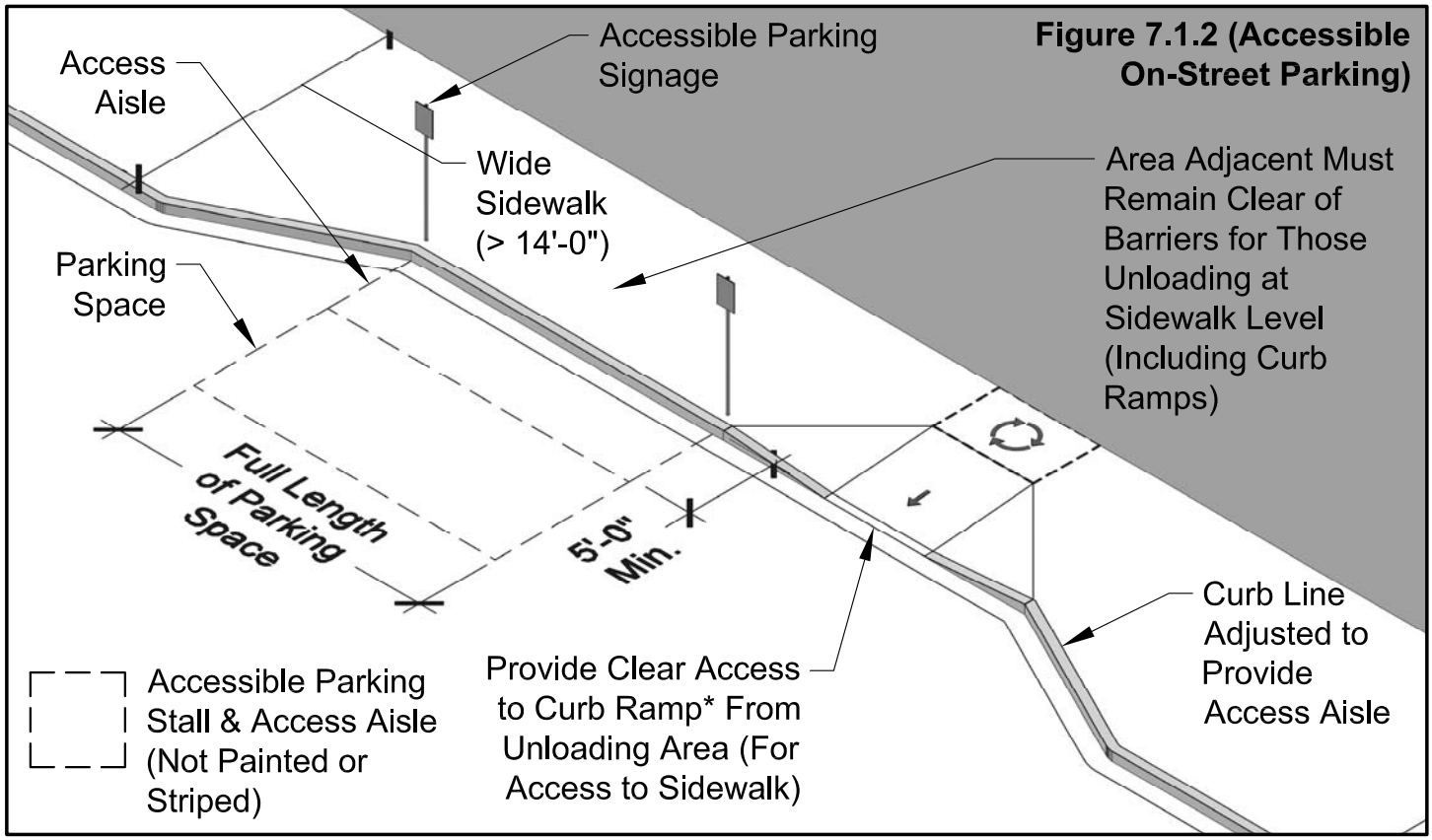


Figure 7.1.2 (Accessible On-Street Parking)

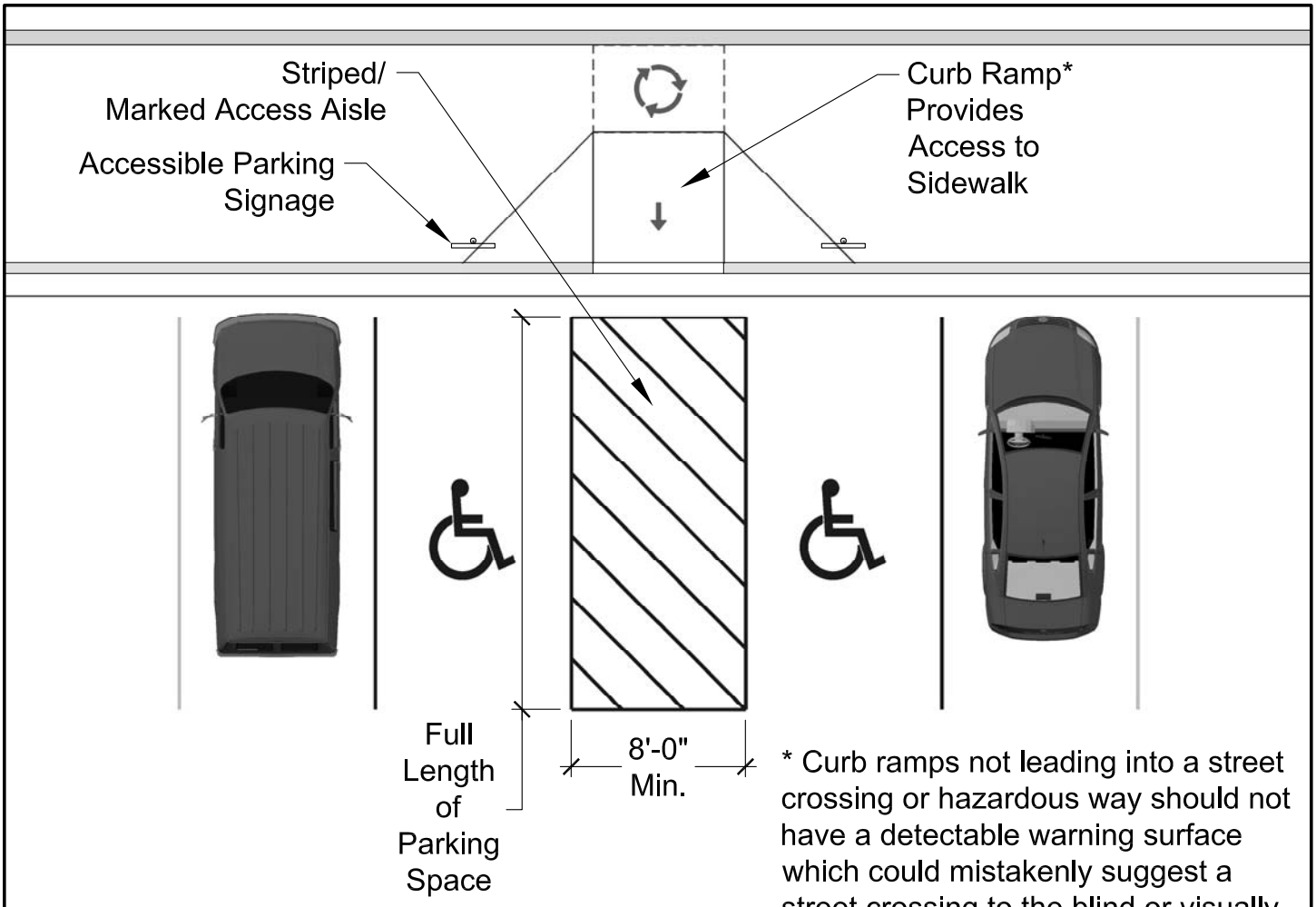
Perpendicular or Angled Parking Spaces

Where perpendicular or diagonal parking is provided, a marked access aisle shall be provided at street level adjacent to the accessible parking space for the full length of the parking space. The marking on the access aisle should discourage parking in the designated area. The access aisle shall connect to the pedestrian access route, by means of curb ramp* if necessary (refer to Section 3.0 for curb ramp requirements).

Advisory: All accessible diagonal and perpendicular parking should assume van parking with wide access aisles (8 feet) is necessary. In many cases, two spaces on either side a of single access aisle will satisfy quantity requirements. Where backing into the space is not permitted, an access aisle for each accessible space should be provided.

Signs

Signs at perpendicular or angled parking spaces shall be located at the head of the parking space. Signs must display the International Symbol of Accessibility.



* Curb ramps not leading into a street crossing or hazardous way should not have a detectable warning surface which could mistakenly suggest a street crossing to the blind or visually impaired.

Figure 7.1.2 (Accessible On-Street Parking)

7.2 Parking & Drop-Offs - Accessible Drop-Offs (Loading Zones)

Passenger loading zones or drop-off areas are typically discouraged and are not permitted due to the following:

1) Pedestrian Safety: Passenger drop-offs and loading zones must be accessible to those with disabilities. As such, a curb ramp will be required to gain access to the sidewalk. These mid-block curb ramps are discouraged as they may be misinterpreted as the location of a street crossing. Pedestrians with mobility impairments may begin to cross a street with traffic approaching, unaware that the opposite side of the street provides no ramp or means to get to a safe location.
2) Limited Right-of-Way: There may not be enough available right-of-way to accommodate the vehicle pull-off area (or access aisle) as well as the curb ramp and landing required for access to the sidewalk.
3) Parking: Motorists may misinterpret the drop-off area as a general parking area.
4) Consistency of Facilitation: Certain types of facilities, such as schools hospitals may be candidates for passenger drop-off and loading zones, but all locations must be designed appropriately and approved when installed in the public way.

According to PROWAG, where passenger loading zones or drop-offs are provided, the following must apply (Figure 7.2.1, next page):

Vehicle Pull-Up Space
Passenger loading zones shall provide a vehicular pull-up space 8 feet wide minimum and 20 feet long minimum.

Access Aisle
Passenger loading zones shall provide access aisles adjacent to the vehicle pull-up space. The access aisle serving the vehicle pull-up space shall be 5 feet minimum in width and it shall match the full length of the pull-up space. The marking on the access aisle should discourage parking in the designated area. The access aisle shall connect to the pedestrian access route, by means of curb ramp* if necessary (refer to Section 3.0 for curb ramp requirements).

Ground Surfaces
Access aisles shall be at the same elevation as the vehicle pull-up space they serve. The surface of the access aisle shall be firm, stable and slip-resistant as well as clear of any and all barriers (refer to Section 2.0 for additional requirements for accessible routes).

Vertical Clearance
Vehicle pull-up spaces, access aisles serving them, and a vehicular route to and from the passenger loading zone shall provide a vertical clearance of 9 feet, 6 inches minimum.

Additional Considerations
- Depending on the particular needs of the passenger exiting and entering the vehicle, alighting may occur at curb level or at street level. (Figures 7.2.2, 7.2.3, page 124)
- For passengers alighting at curb level, the adjacent sidewalk must be free and clear of any barriers, including curb ramps. (Figure 7.2.1, next page)
- Because an accessible connection is required up to the sidewalk level, it may be necessary to identify appropriate curb ramps especially when extended drop-off and access aisle areas are not possible due to limited available right-of-way. (Figure 7.2.4, page 124)

* Curb ramps not leading into a street crossing or hazardous way should not have a detectable warning surface which could mistakenly suggest a street crossing to the blind or visually impaired.

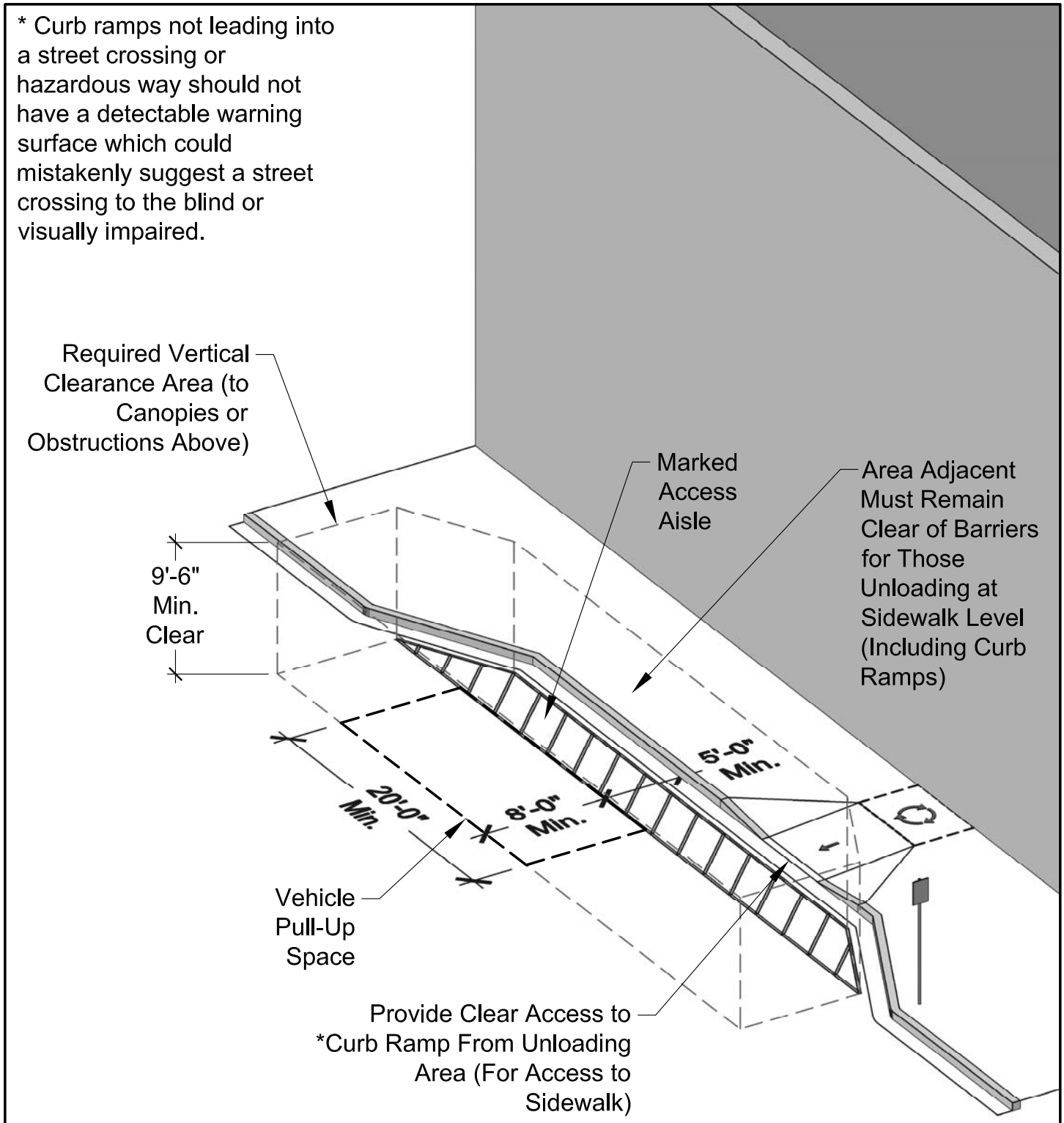


Figure 7.2.1 (Accessible Drop-Offs)

Figure 7.2.2 (Accessible Drop-Offs)

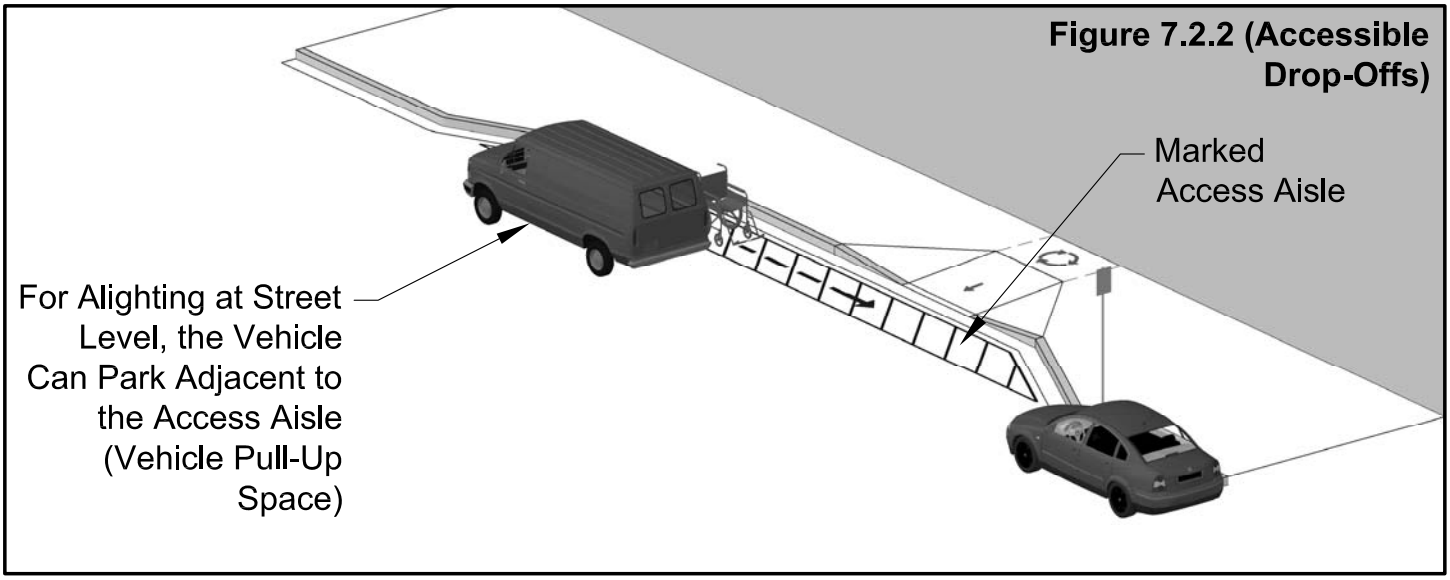


Figure 7.2.3 (Accessible Drop-Offs)

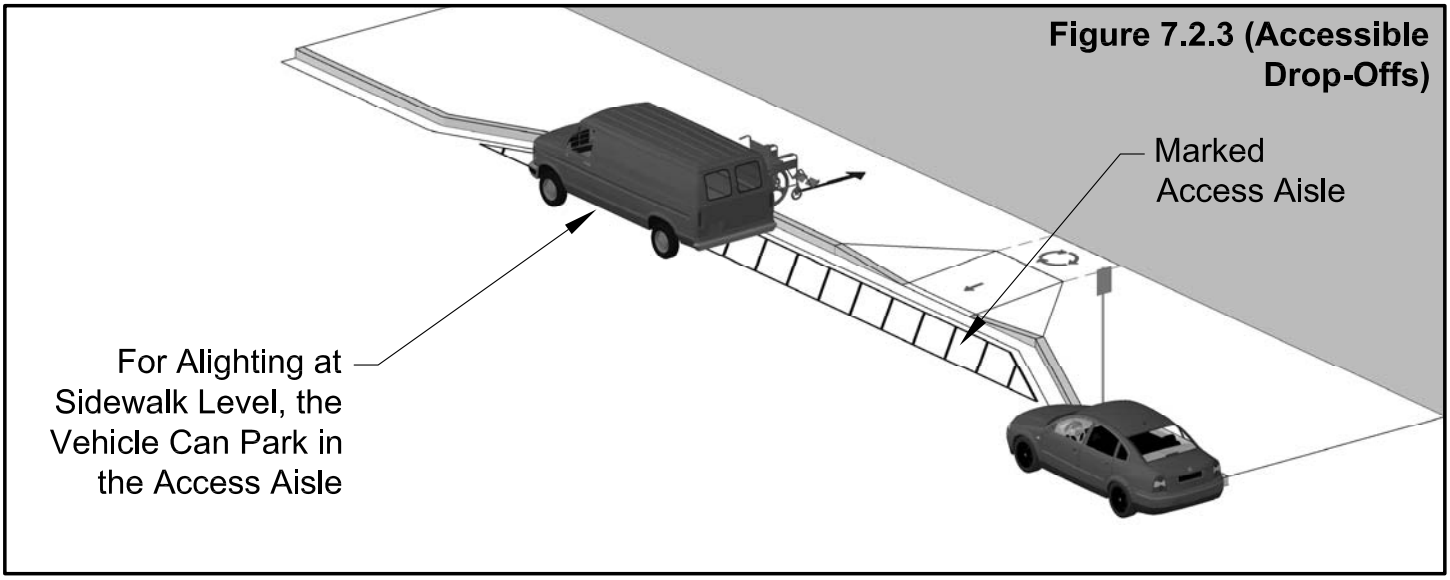
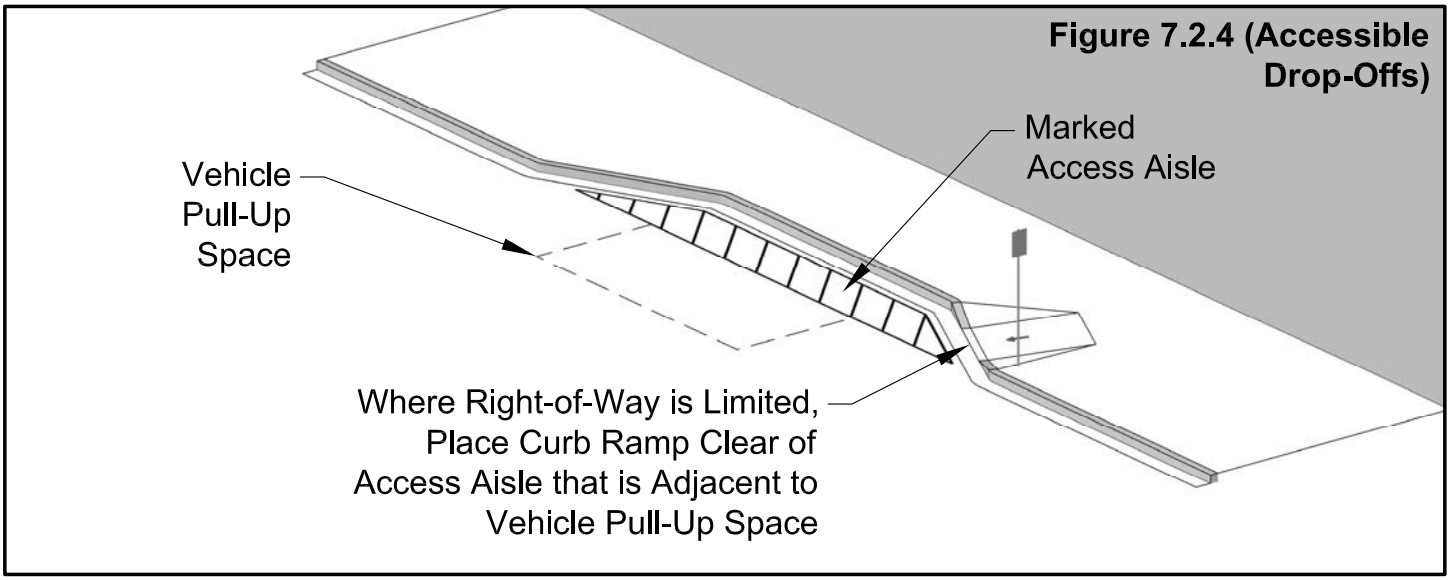


Figure 7.2.4 (Accessible Drop-Offs)



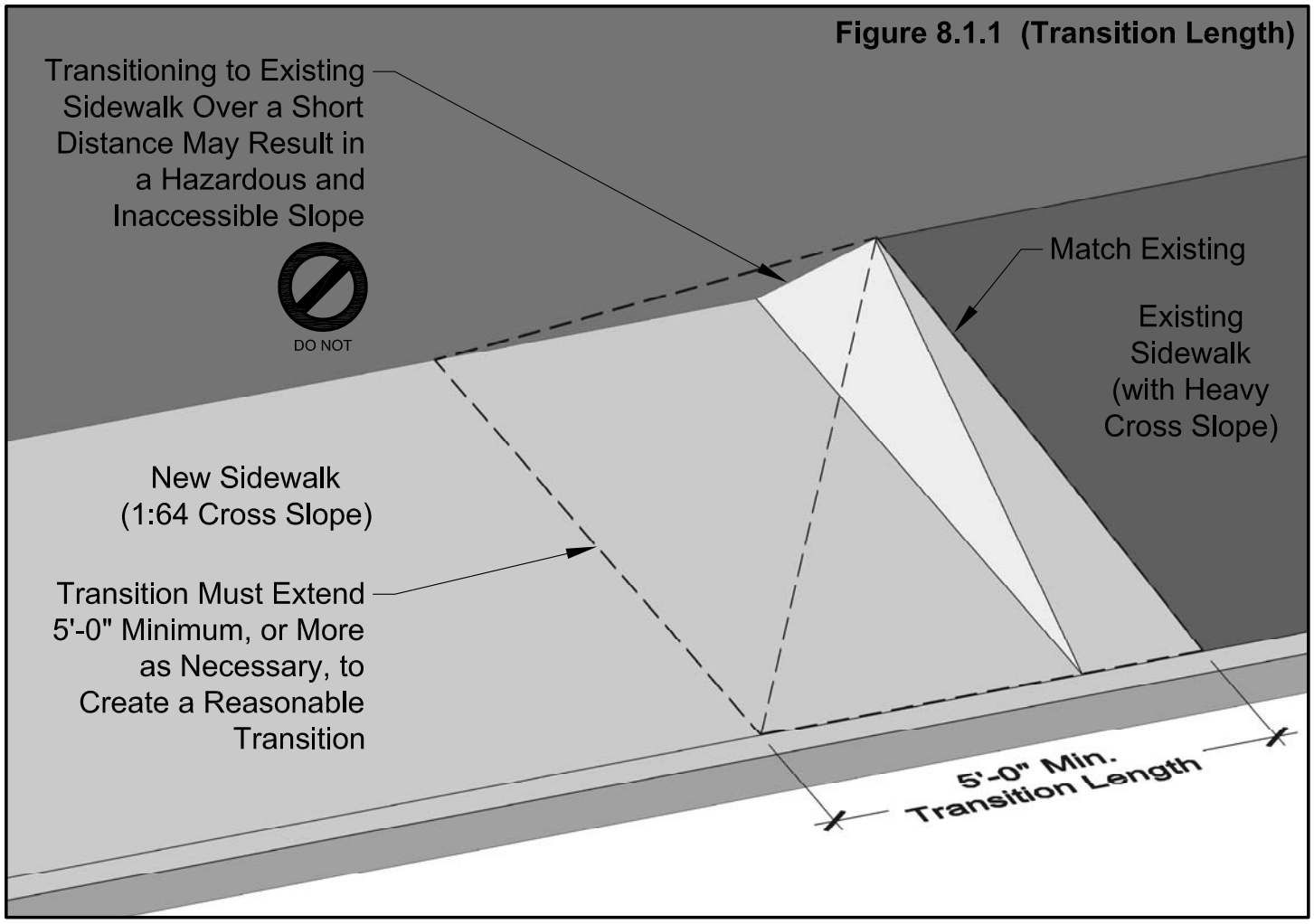
8.0 Miscellaneous

8.1 Miscellaneous - Transitioning to Existing

8.1.1 Minimum Transition Length

Whenever existing sidewalk is removed and replaced, it is important to make the transition from the newly placed sidewalk to the existing as smooth as possible. Because the existing sidewalk may have been built with a cross slope that is steeper than today's standard maximum, the length of the smooth transition must at minimum be 5 feet in order to avoid a very steep and hazardous section of sidewalk for all pedestrians. (Figure 8.1.1) In some cases the transitional area must be extended beyond the minimal 5 foot length in order to provide a more reasonable transition. Refer to Section 8.1.2 for slope requirements at transitional sections of sidewalk.

Figure 8.1.1 (Transition Length)



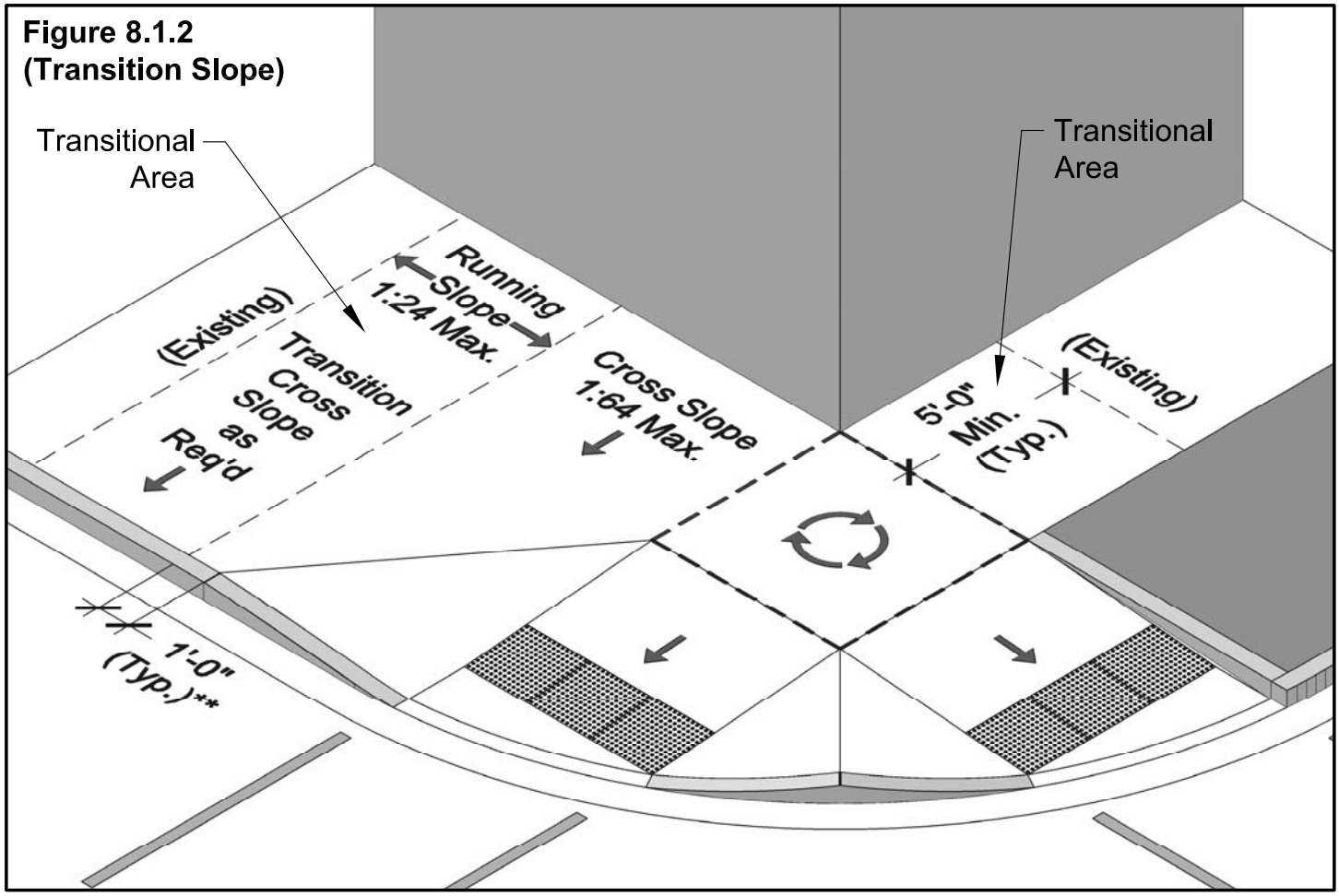
8.1.2 Transition Slope Requirements

The typical challenge when transitioning from a newly improved area of sidewalk is the degree of cross slope to be met at the existing sidewalk. It may be necessary to warp the new sidewalk at a slope which will match the existing sidewalk.

When transitioning to existing, the running slope ideally adheres to the maximum running slope of a typical sidewalk per the CDOT requirement of 1:24 maximum (1:20 max.*). (Figure 8.1.2)

For designers, the running slope may also be a challenge when transitioning from a curb ramp. Designing for curb ramps should not incorporate a steep transitional sidewalk to connect the ramp or ramp landing to the top of sidewalk elevation. The elevation difference should preferably be contained within the bounds of the ramps and not extended beyond the ramp landing. Designing combination curb ramps should be considered only if all other options have been exhausted.

Figure 8.1.2
(Transition Slope)



* This dimension or condition may be applied only in alterations to the existing as-built environment when the CDOT standard is not technically feasible or cannot be implemented without creating an unfavorable design solution.

** The transitional area adjacent to curb ramps with full width concrete sidewalk begins 1 foot from the top edge of the ramp side flare, insuring that all newly placed sidewalk abutting the ramp and ramp side flare will be accessible and compliant.

8.1.2 Transition Slope Requirements (cont.)

When existing site constraints are encountered, such as an existing facility entrance, the running slope may be increased in the transitional area up to 1:14 maximum (1:12 max.*). If the transition must be increased, the cross slope should be maintained at 1:64 to make the section of sidewalk traversable as a ramp.

When the transitional area slope is required to be increased up to the 1:14 maximum, the requirements of a ramp must be adhered to. Grade breaks for these steep transitional areas are required to be perpendicular to the direction of travel.

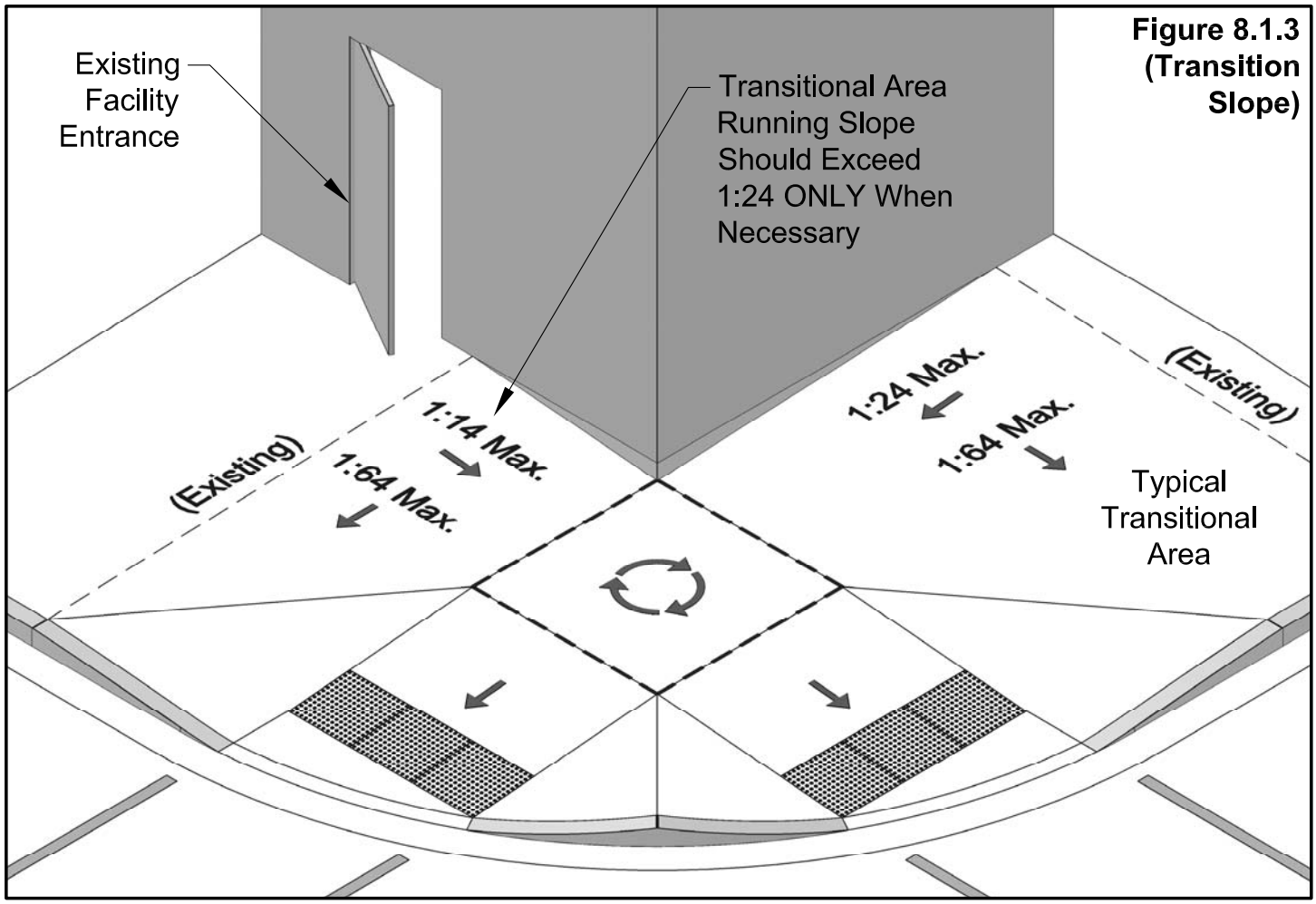


Figure 8.1.3 (Transition Slope)

* This dimension or condition may be applied only in alterations to the existing as-built environment when the CDOT standard is not technically feasible or cannot be implemented without creating an unfavorable design solution.

8.1.3 Flush Transitions

The transition of pedestrian surfaces from new to existing must satisfy the requirements of accessible routes (Refer to Section 2.3 for additional information). The sidewalk control joint separating the new and existing surfaces cannot exceed 1/2 inch maximum in width and the two surfaces must not vary in elevation. The transition panel of sidewalk may have to be warped in order to match an existing sidewalk with a high cross slope but the change in level between the two surfaces cannot exceed 1/4 inch.

When the existing sidewalk being transitioned to is damaged or generally inaccessible, consideration must be given to expanding the scope of work to include removal and replacement of damaged sidewalk. However, if the replacement of the damaged sidewalk cannot be included in the given scope of work, the goal is to provide a compliant section of sidewalk or curb ramp that can be tied into in the future when the sidewalk can be replaced. (Figure 8.1.4)

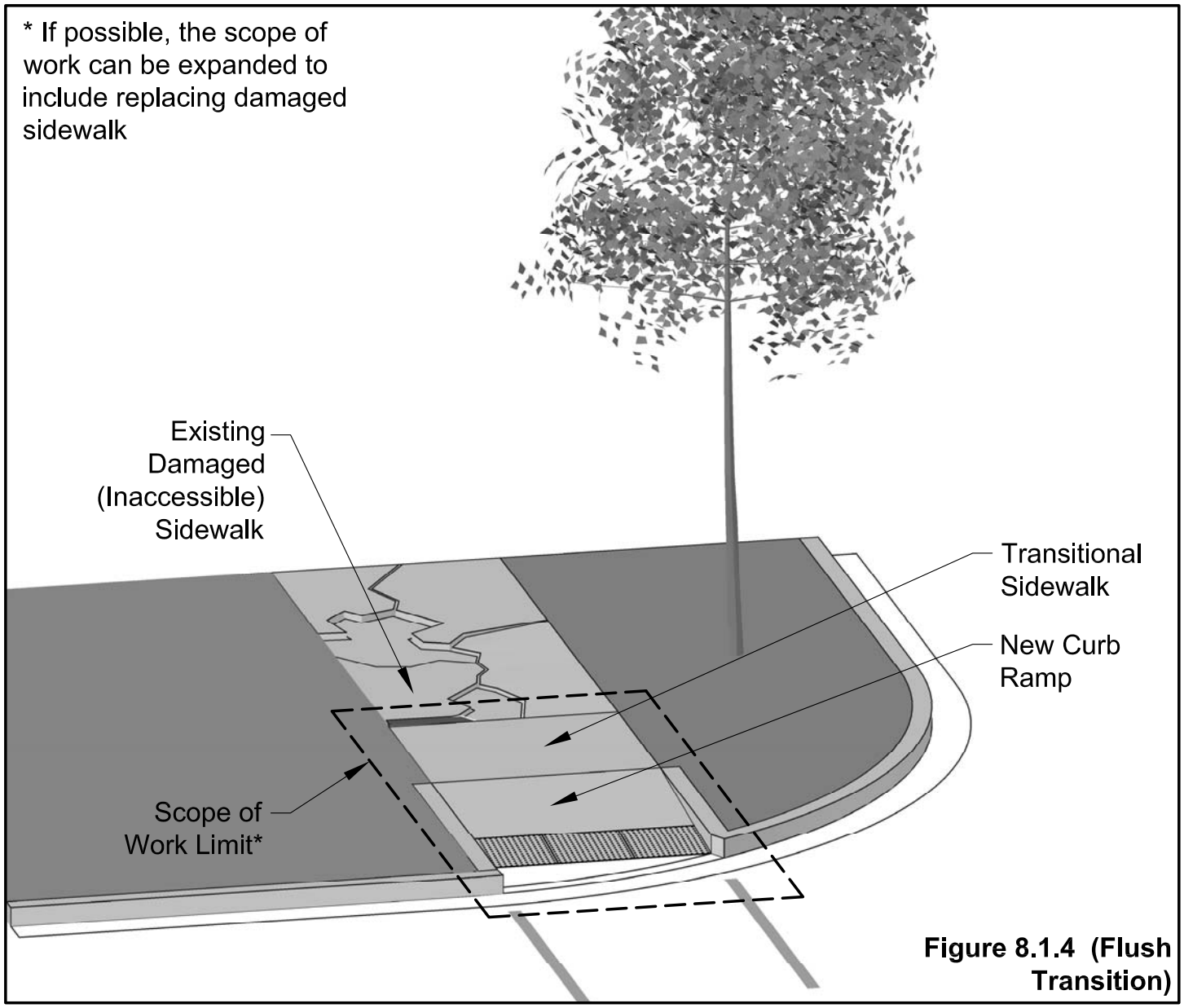


Figure 8.1.4 (Flush Transition)

8.1.4 Maintaining Access

When pedestrian access route with a compliant cross slope cannot be provided for the full width of a given sidewalk, the transition slope from the edge of the accessible route down to the top of curb should preferably be held to a maximum of 4%. Pedestrian safety is the main concern when limiting the slope down to the top of curb.

As a design alternative the curb height may be adjusted to a maximum of 9 inches. By raising the curb, the slope of the transitional area may be lessened in order to achieve the 4% maximum. Curbs greater than 9 inches are not permitted. (Figure 8.1.5)

If existing site constraints prove this 4% maximum difficult or impossible to achieve, design approval of the most compliant alternative must be explored.

If adjusting the curb height does not address the elevation difference between the street and sidewalk, there may be an opportunity to take advantage of a landscaped parkway, particularly in residential neighborhoods. The slope from the edge sidewalk through the parkway down to the top-of-curb does not need to be held at 4%, as the parkway is not part of the pedestrian way. (Figure 8.1.6)

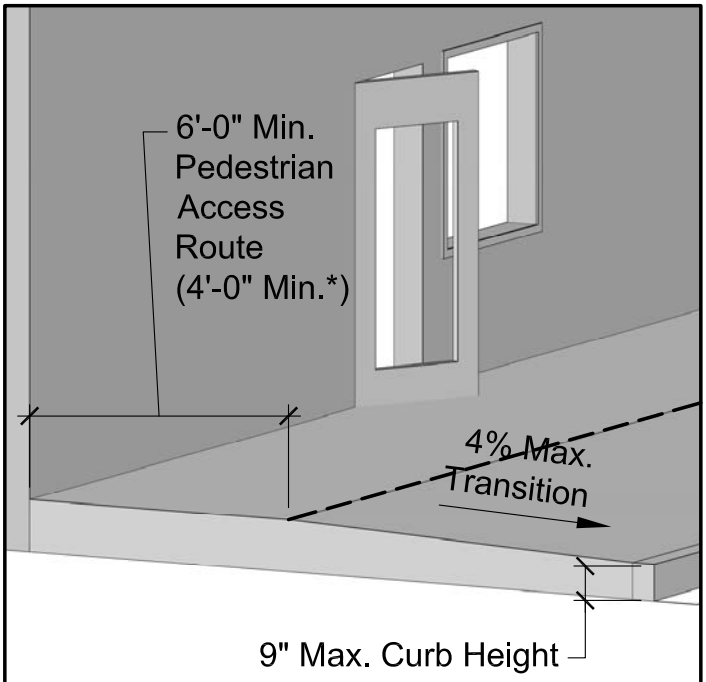


Figure 8.1.5 (Transition - Accessible Route)

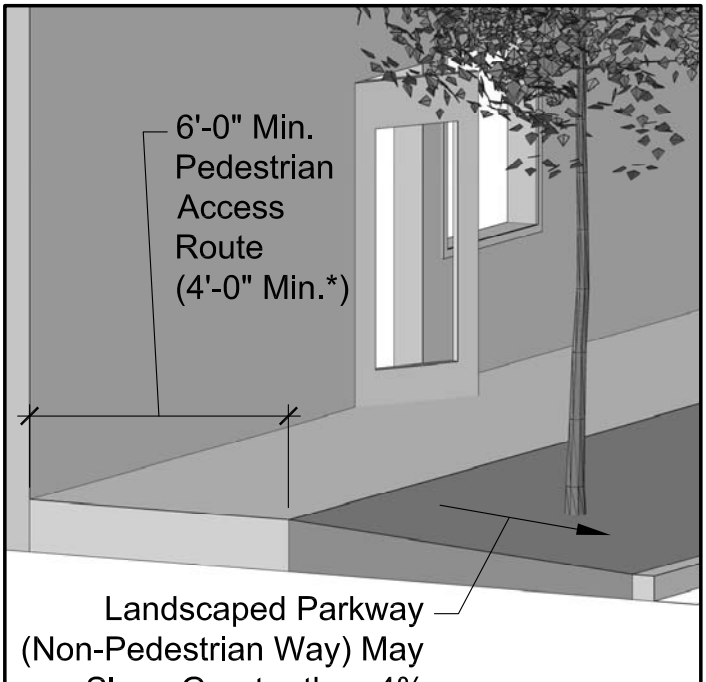


Figure 8.1.6 (Transition - Accessible Route)

* This dimension or condition may be applied only in alterations to the existing as-built environment when the CDOT standard is not technically feasible or cannot be implemented without creating an unfavorable design solution.

8.1.4 Maintaining Access (cont.)

The public right-of-way is often occupied with traffic signal and light poles, utility poles, benches, bus stop shelters, and other types of street furniture. When a project involves improvement of the curb ramps at the corner of an intersection or any sidewalk in general, it is important to consider the means of accessing the improved area when transitioning to the existing sidewalk. The positioning of the street furniture must physically allow for the passage of a pedestrian in a wheel chair (refer to Section 2.0 for additional information). Transitioning or warping the sidewalk to meet existing conditions must provide a smooth and flat transitional area in the clear, even if it is shifted from the typical path location. (Figure 8.1.7)

However, when transitioning to the existing sidewalk, it is not permissible to reduce access to facilities or functions in the public way such as bus-stops, pay phones, and benches. If necessary, the scope of work may need to be slightly expanded to provide accessible sidewalks adjacent to such existing facilities. At a minimum, the existing conditions, including the slopes and any other physical features related to accessibility must be matched if not improved. Refer to Section 8.2 for access requirements at bus stops and and other facilities typically located in the public way.

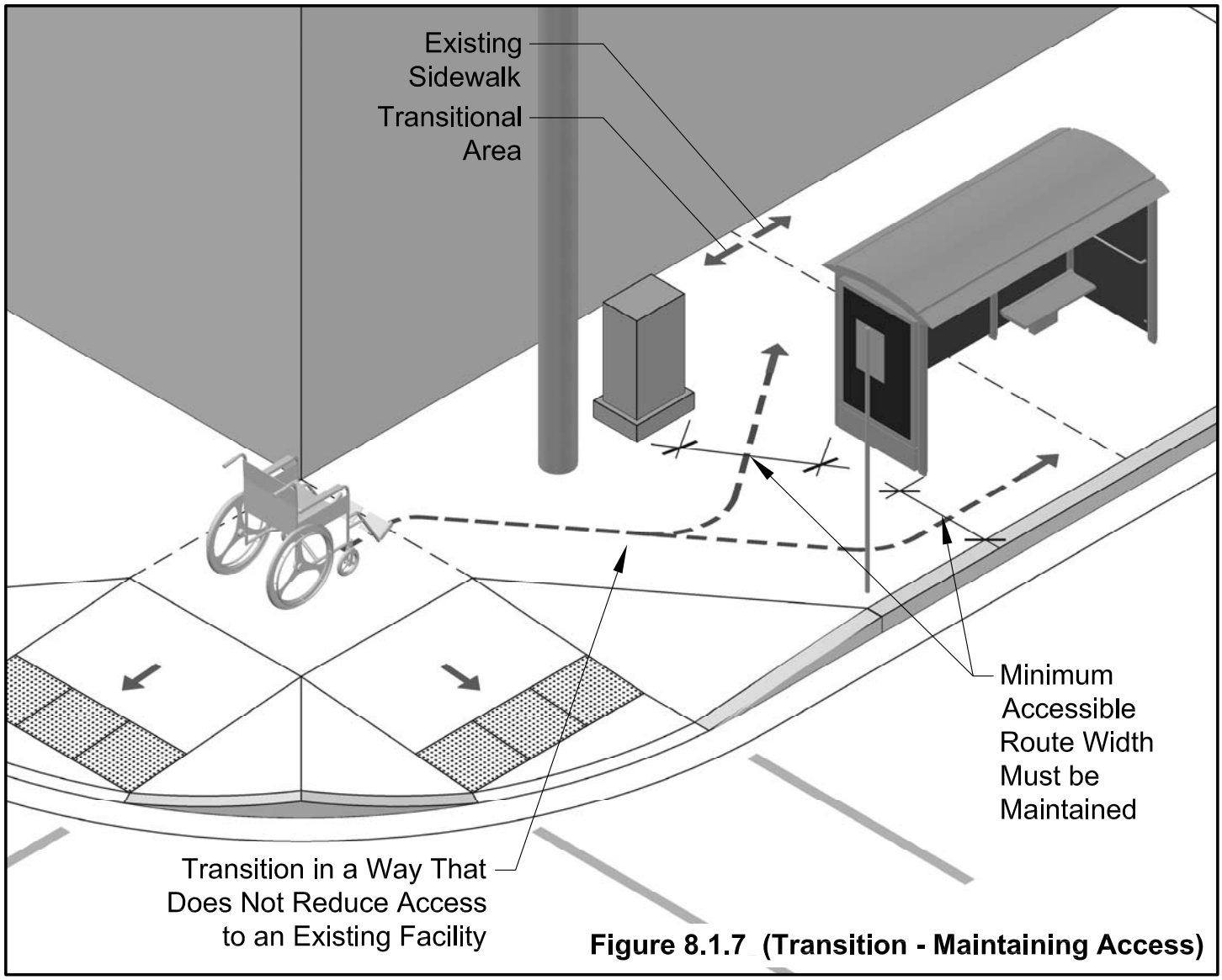


Figure 8.1.7 (Transition - Maintaining Access)

8.1.4 Maintaining Access (cont.)

When transitioning to the existing sidewalk, it is not permissible to reduce access to existing building or business entries, gates, or any other facility access points. The scope of work may need to be expanded to provide an accessible sidewalk adjacent to an existing facility. Per the ADA, any removed feature providing access to a facility must be replaced in an accessible and compliant way; at a minimum the existing conditions, including the slopes and any other physical feature related to accessibility, must be matched if not improved. Refer to Section 8.2 for access requirements at door entries. (Figure 8.1.8)

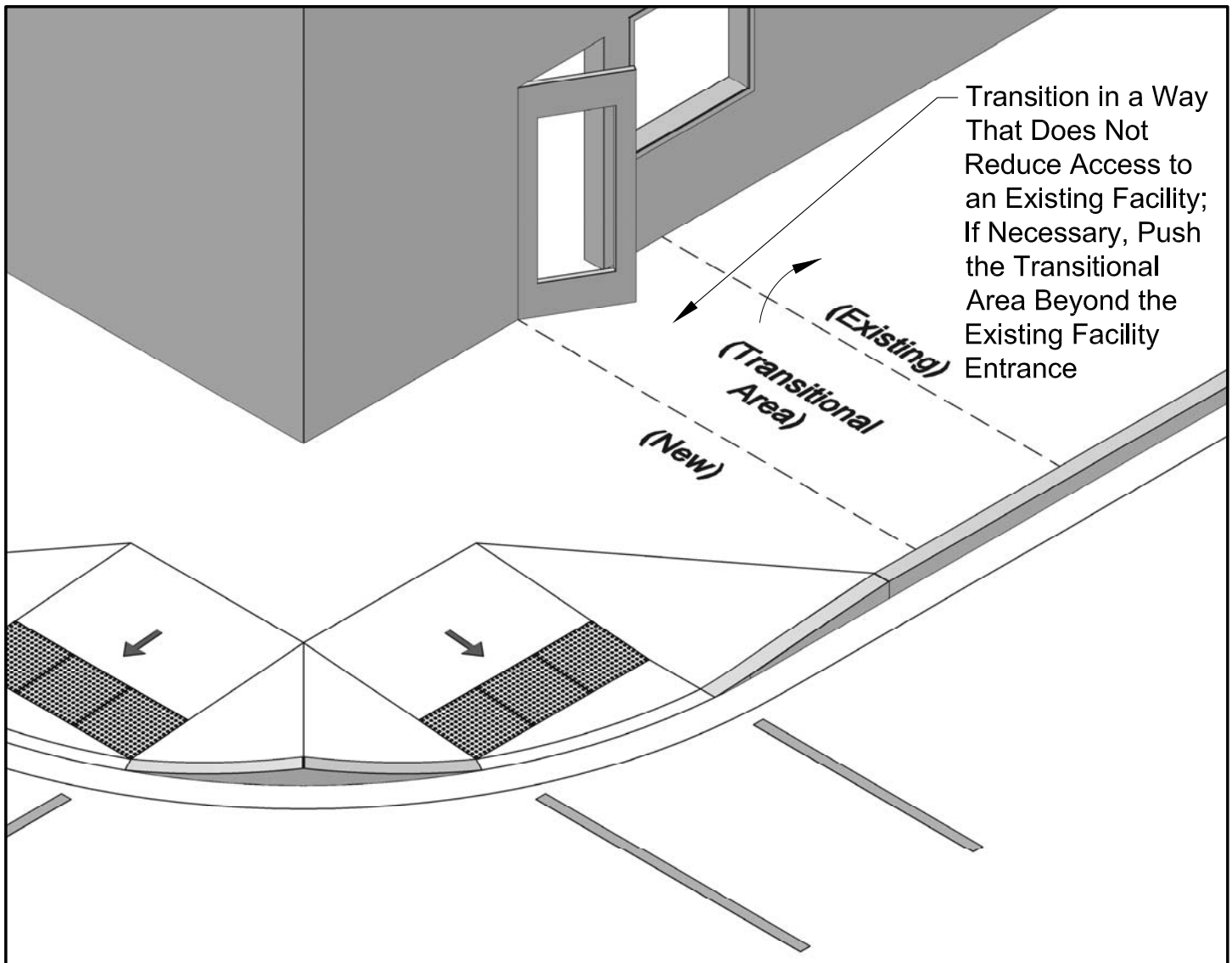


Figure 8.1.8 (Transition - Maintaining Access)

8.2 Miscellaneous - Access to Facilities

8.2.1 Overview

Because the public way serves as a means to access a variety of different facilities, both public and private, it is imperative that access to these areas is not reduced when performing alterations.

ADAAG clearly stipulates that an alteration shall not reduce the level of accessibility to an existing element, space, or area of a building or facility. Work in the public way is not typically intended to improve the access to adjacent facilities. At a minimum the existing physical conditions used to access these facilities, whether they be residences, private businesses, public pay phones, or bus stops must be maintained. The accessibility conditions beyond the public right-of-way are the responsibility of the entity that occupies that said space, per the ADA. (Figures 8.2.1, 8.2.2, page 133)

Any alteration taken that would make access more difficult, no matter how minor the change, would be considered a reduction of access. The slopes of the sidewalk cannot be increased, steps cannot be added to an existing stairway or created where none exist, nor can any other barrier be added or situated in a way that would compromise access.

When existing conditions allow for the opportunity to improve access to facilities by expanding the scope of work of a project, any reasonable options should be considered.

8.2.2 Facility Entries

While new construction standards strive to guarantee a much more thorough level of accessibility at facility entries, dealing with existing conditions offers a challenge to maintain the level of existing facility access at a minimum.

Steps/Stairways

The addition or creation of a new step at an existing entry can make accessibility more difficult or impossible for some pedestrians and can potentially conflict the local building code.

Alterations made to existing steps or stairways may also trigger requirements found in current adopted building codes such as requirements regarding riser height, tread depth, stair landings, and handrails. Additionally, because work performed at the existing door entry would trigger a requirement to make the entry accessible (per ADAAG, CBC), it is possible that a ramped surface should be provided for wheelchair access. (Figures 8.2.3 - 8.2.6, pages 134, 135)

Steep Transitions

Transitioning too steeply from newly placed sidewalk or ramp landing areas at a lower elevation up to the property line adjacent to a facility entrance may reduce the level of access. Reduction of access is not permitted. The steep slopes may create a difficulty for some pedestrians attempting to enter a facility that previously had no barriers. (Figure 8.2.7, page 136)

Transitioning to existing stairways leading up to entries with a sloped sidewalk is a reduction of access. The top and bottom of newly constructed stairs are required to have landings and a slope at the base of a step does not provide a safe landing. (Figure 8.2.8, page 136)

8.2.2 Facility Entries (cont.)

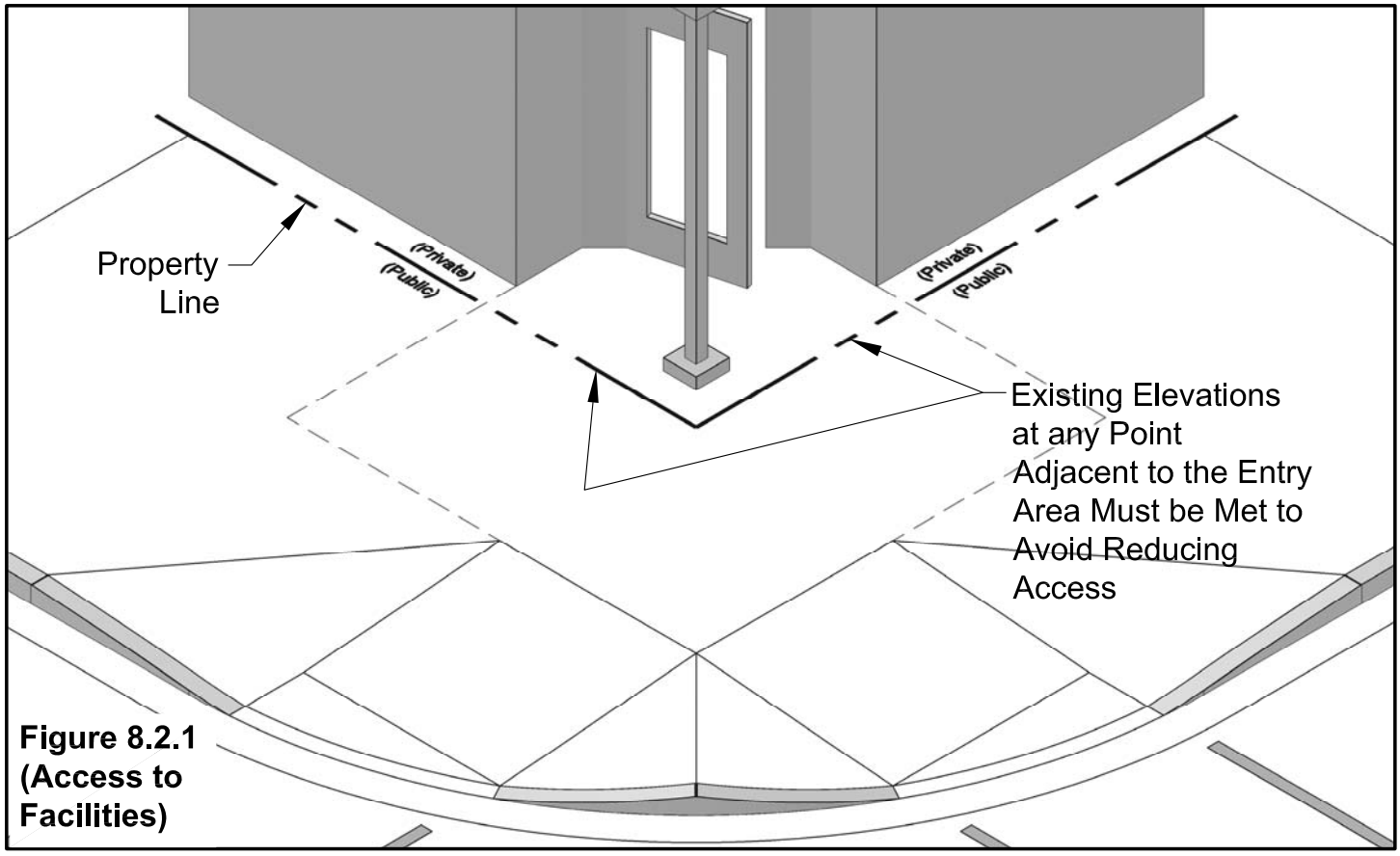


Figure 8.2.1 (Access to Facilities)

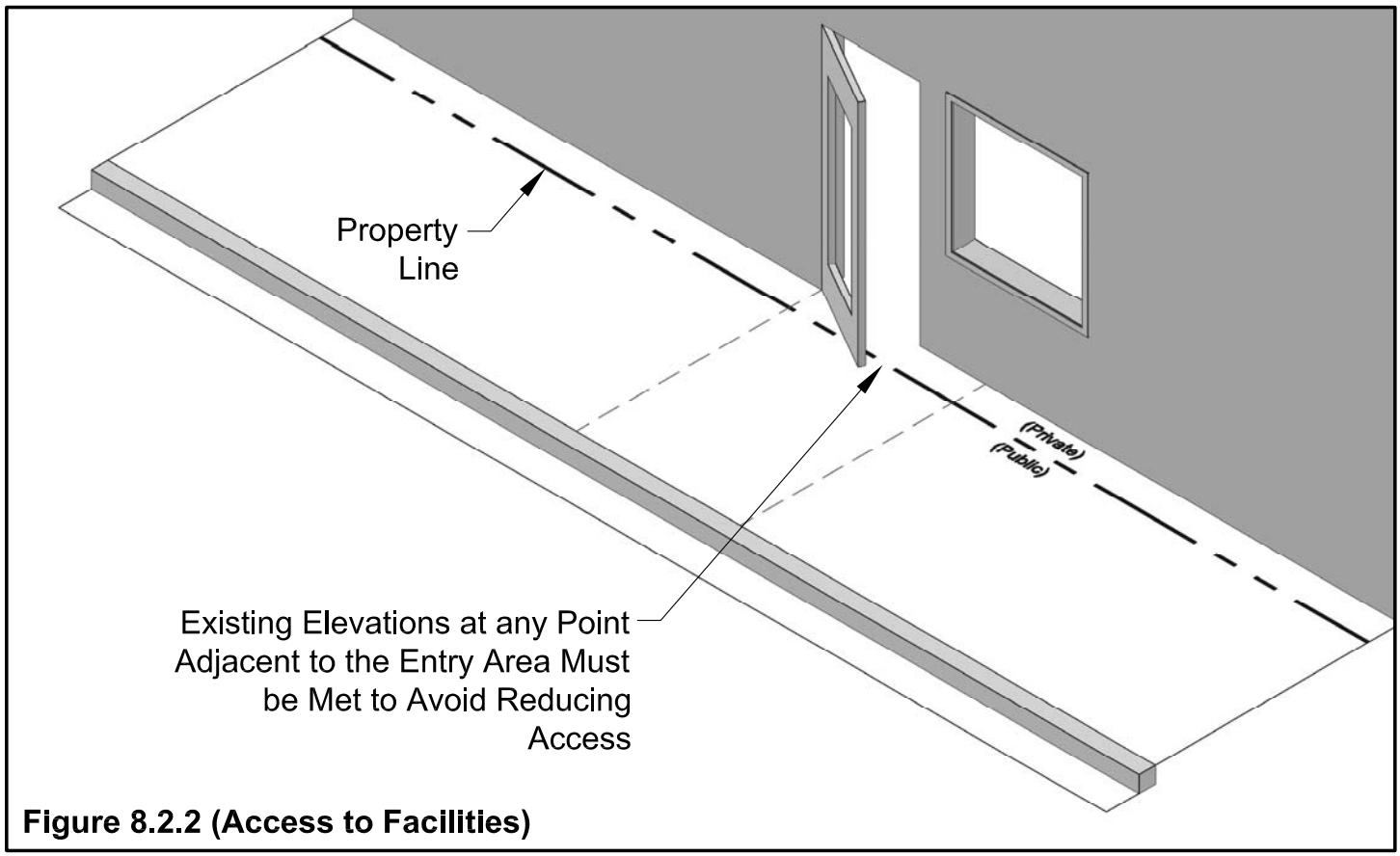


Figure 8.2.2 (Access to Facilities)

8.2.2 Facility Entries (cont.)

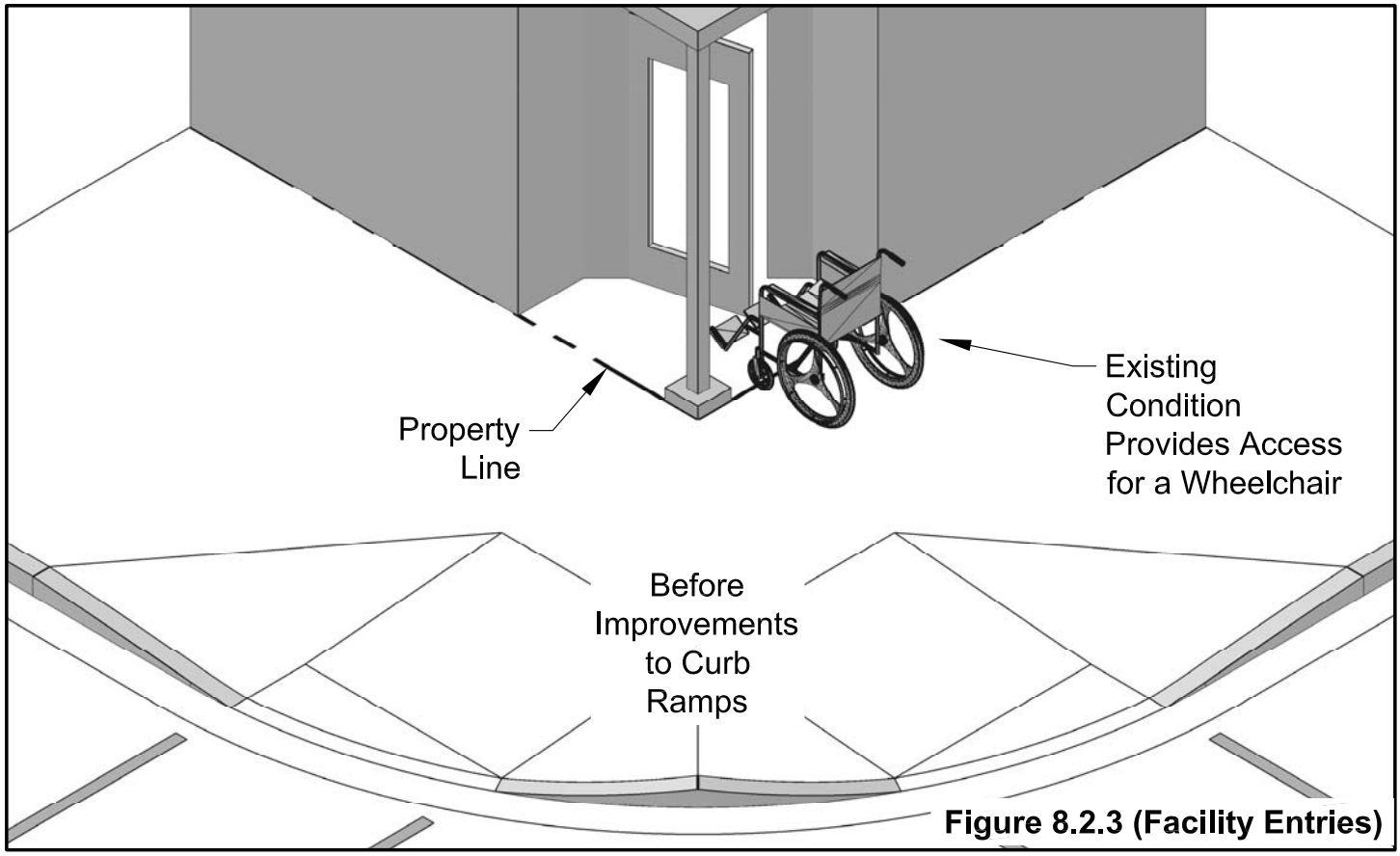


Figure 8.2.3 (Facility Entries)

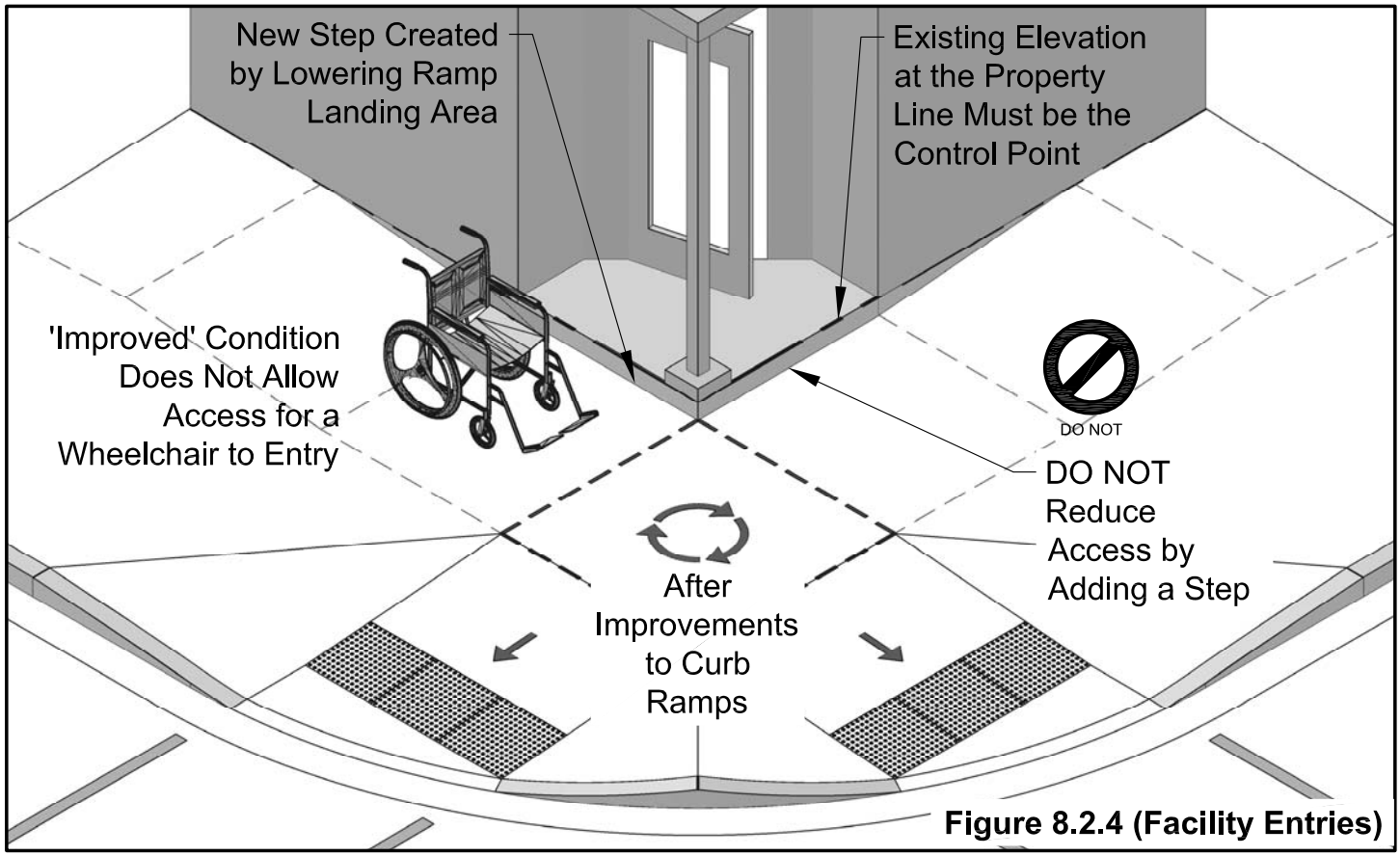


Figure 8.2.4 (Facility Entries)

8.2.2 Facility Entries (cont.)

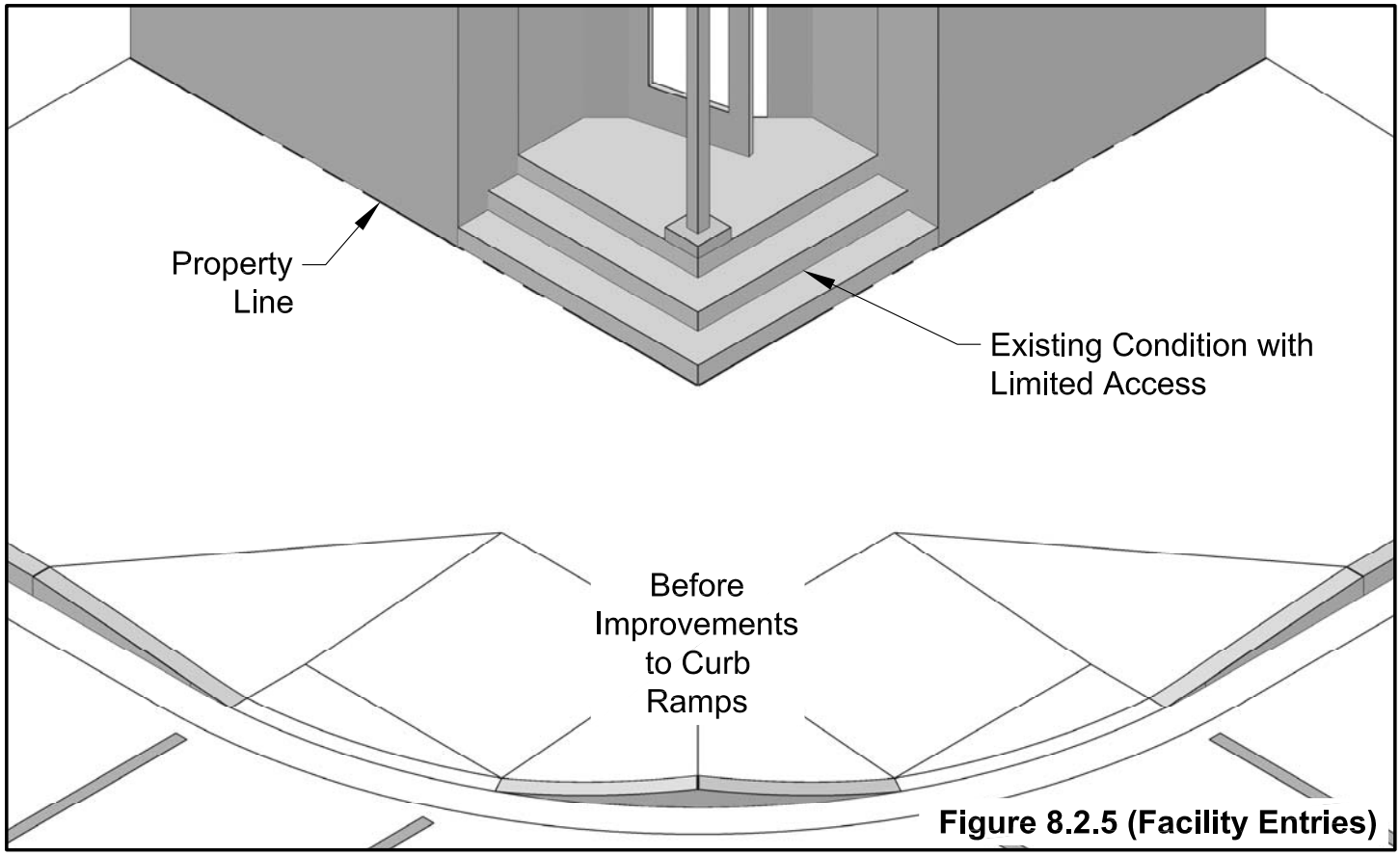


Figure 8.2.5 (Facility Entries)

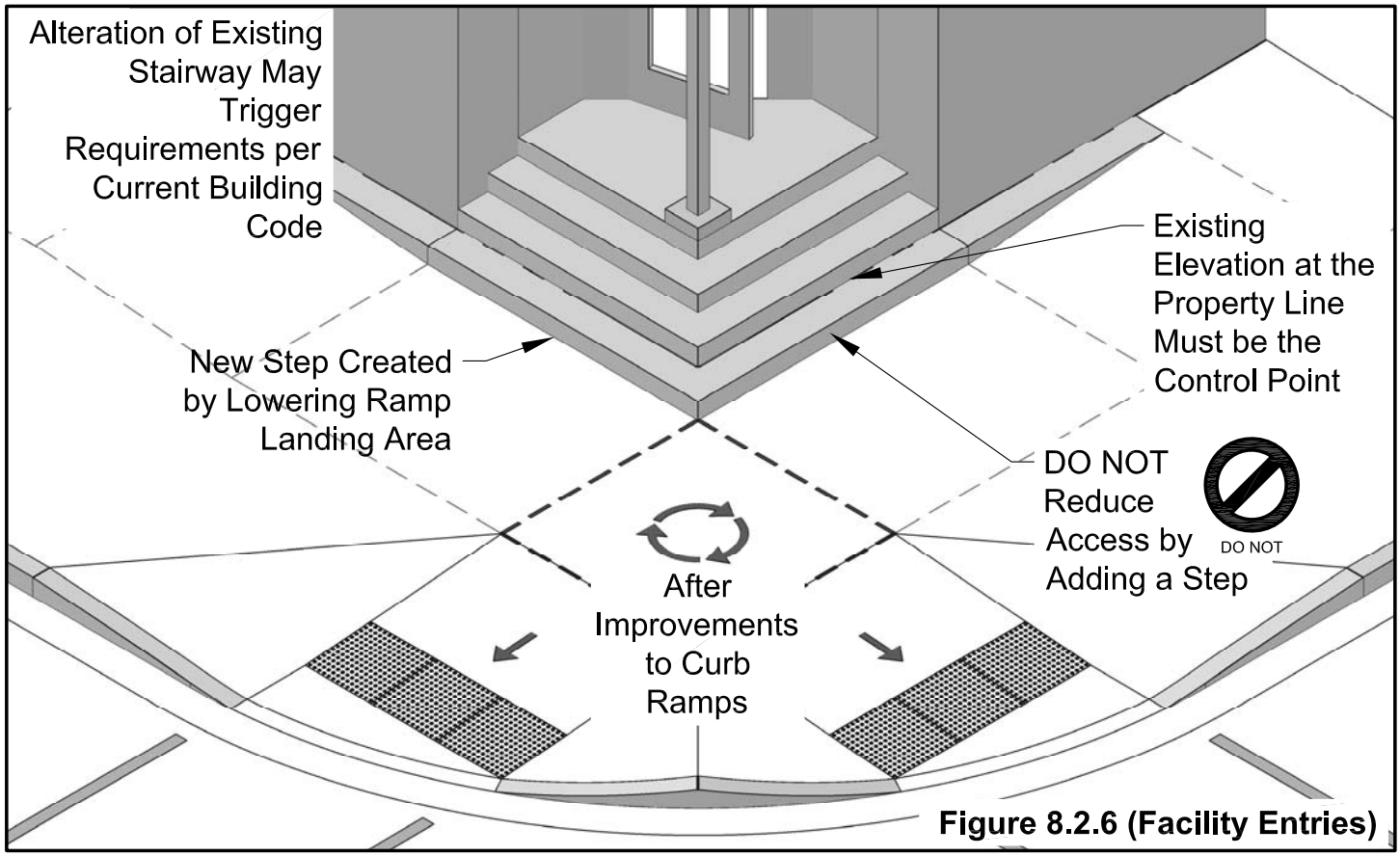


Figure 8.2.6 (Facility Entries)

8.2.2 Facility Entries (cont.)

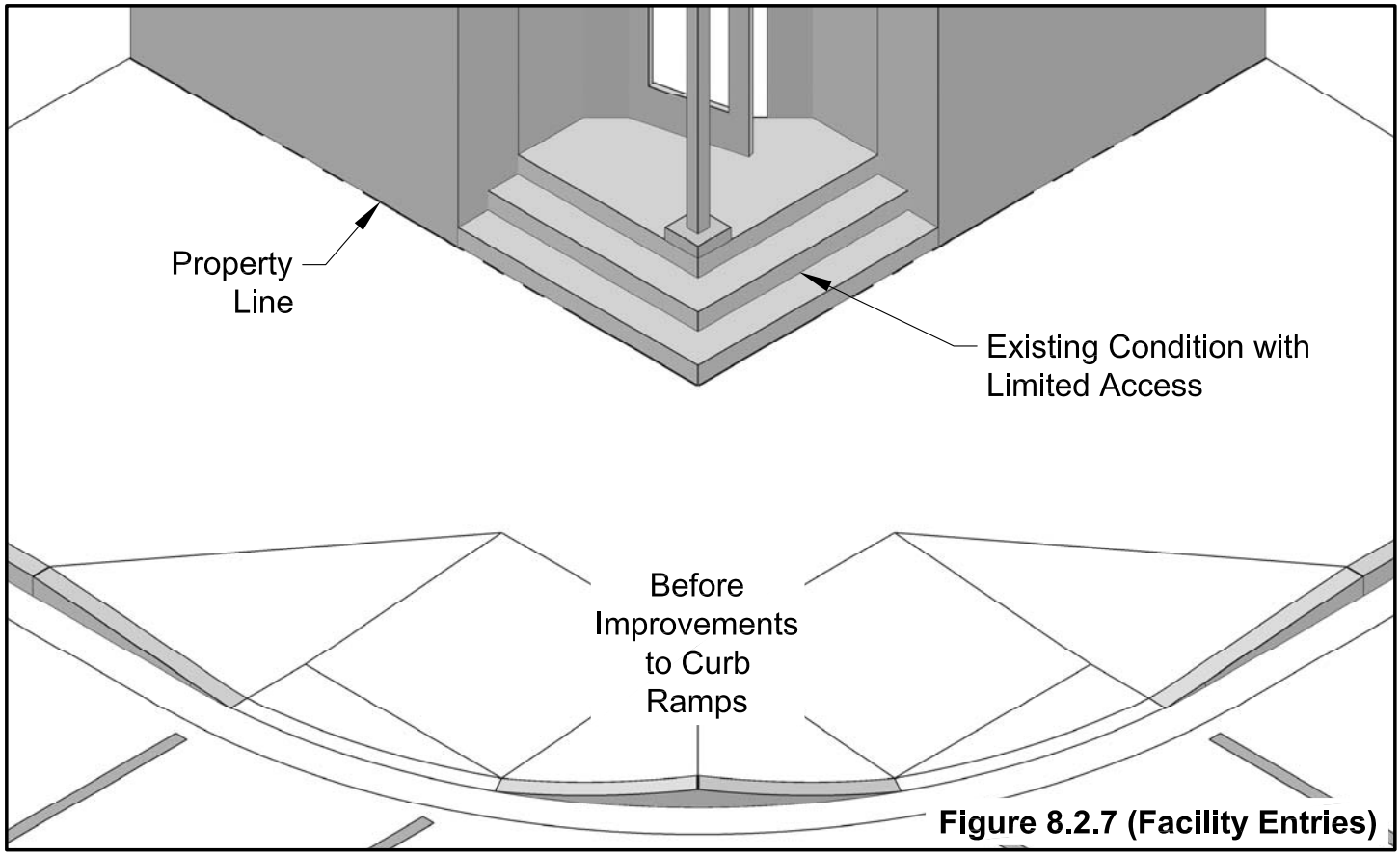


Figure 8.2.7 (Facility Entries)

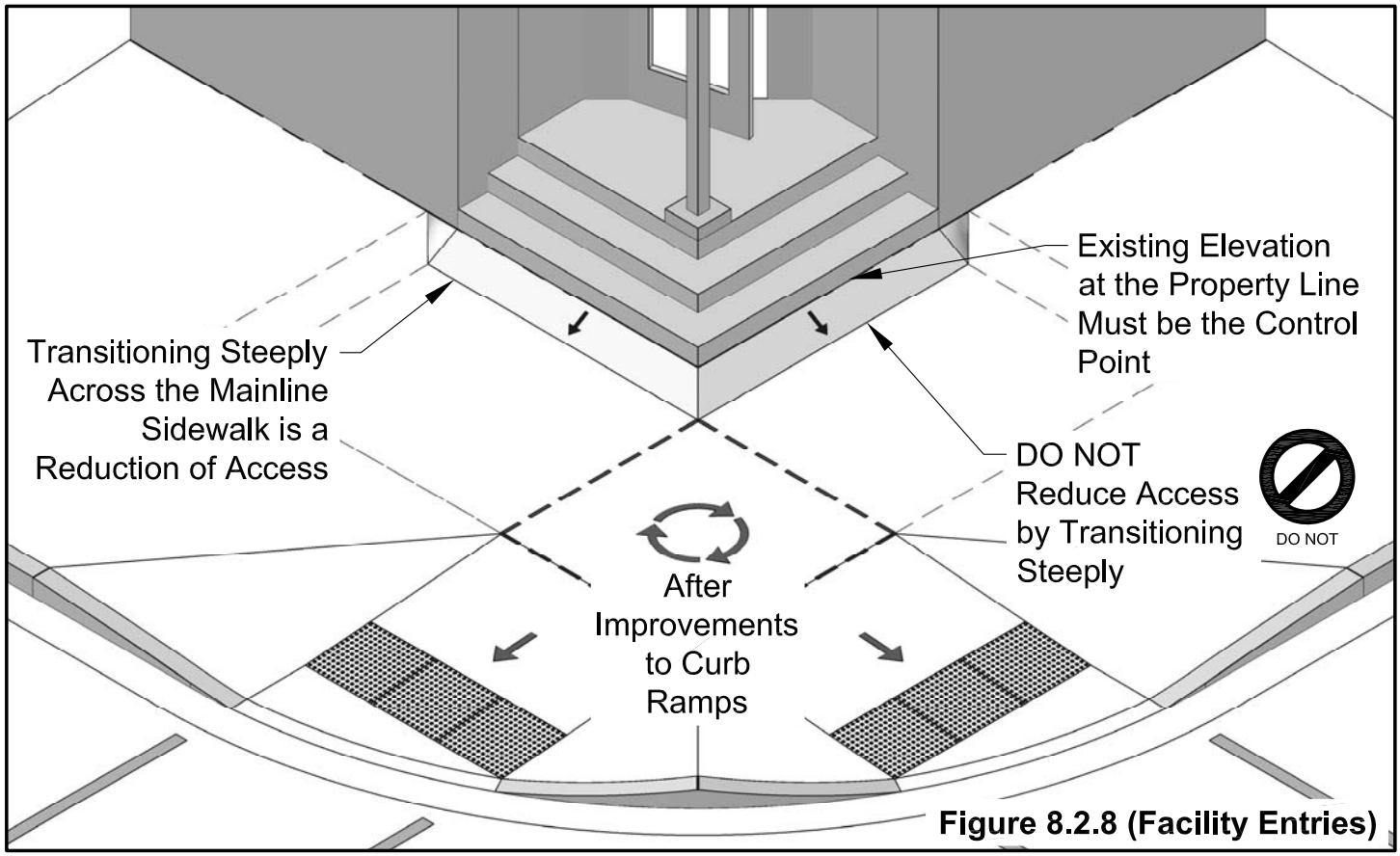


Figure 8.2.8 (Facility Entries)

8.2.3 Required Door Maneuvering Clearance

In new construction, doorways and gates are required to include a clear maneuvering areas that allow adequate room for disabled patrons to operate the door hardware and access the facility or space. The maneuvering areas must be clear of all obstructions and the slopes must be flat (less than 2%) in all directions. (Figures 8.2.9 - 8.2.12)

When improving the public way adjacent to facility access points, including door or gate entries, the maintenance of existing clear maneuvering areas is required. The clear maneuvering areas vary in dimension according to the direction of the approach to the door and the direction of the door swing.

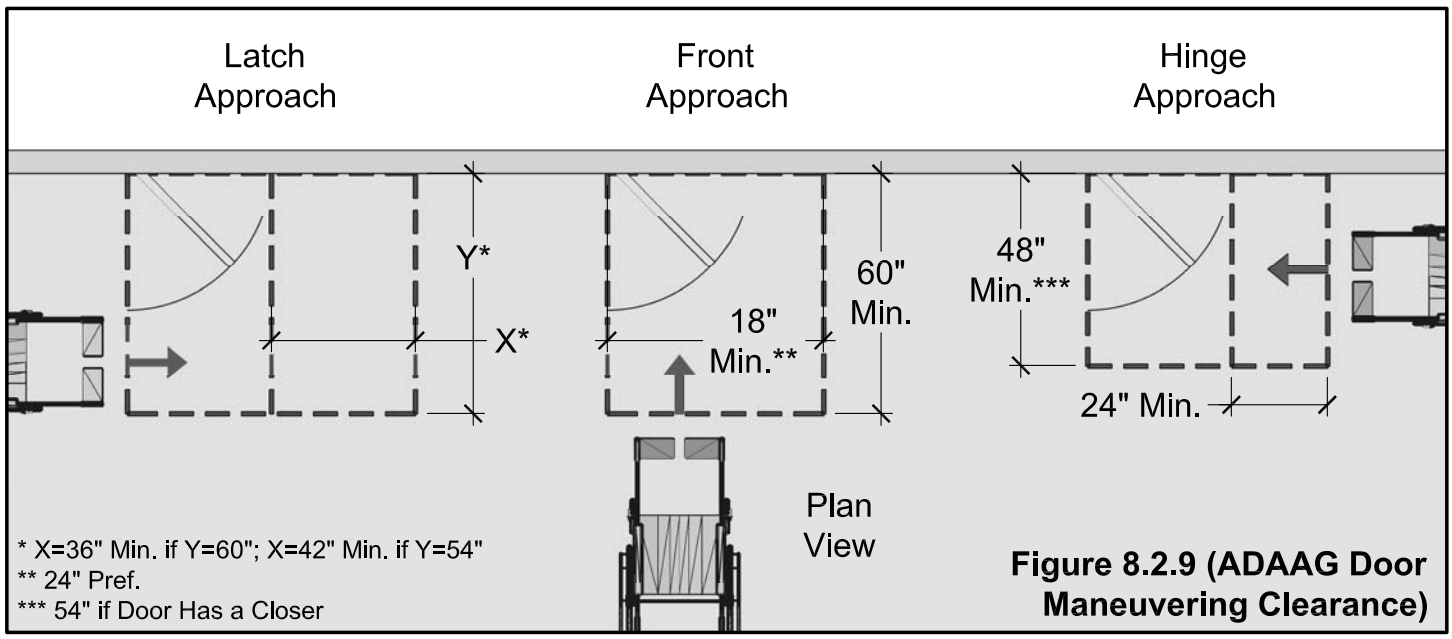


Figure 8.2.9 (ADAAG Door Maneuvering Clearance)

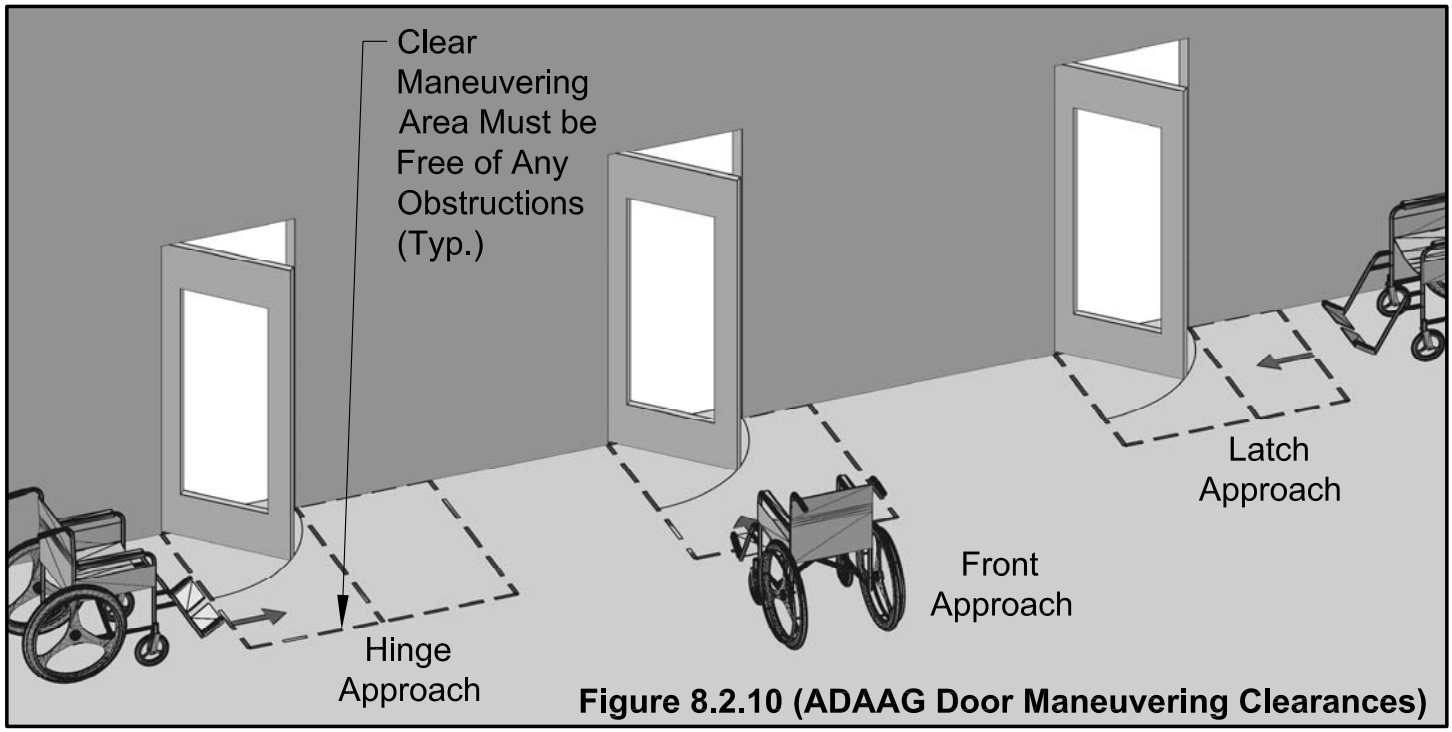


Figure 8.2.10 (ADAAG Door Maneuvering Clearances)

8.2.3 Required Door Maneuvering Clearance (cont.)

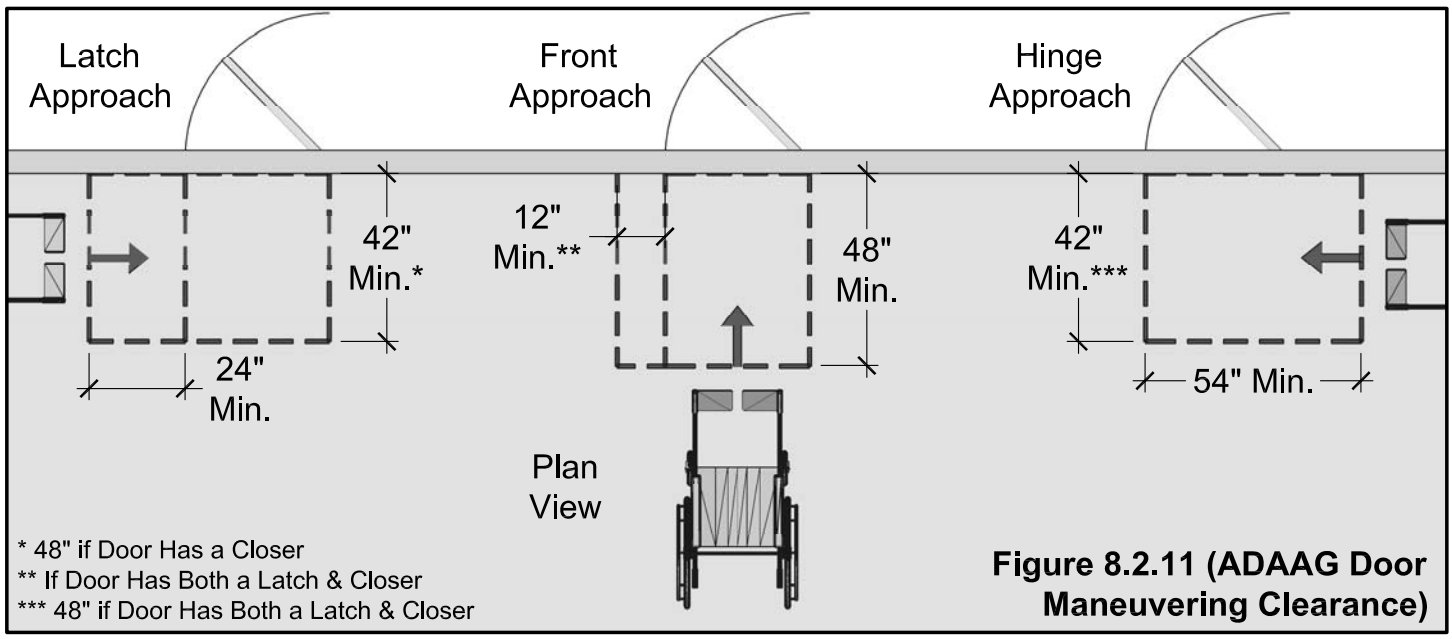


Figure 8.2.11 (ADAAG Door Maneuvering Clearance)

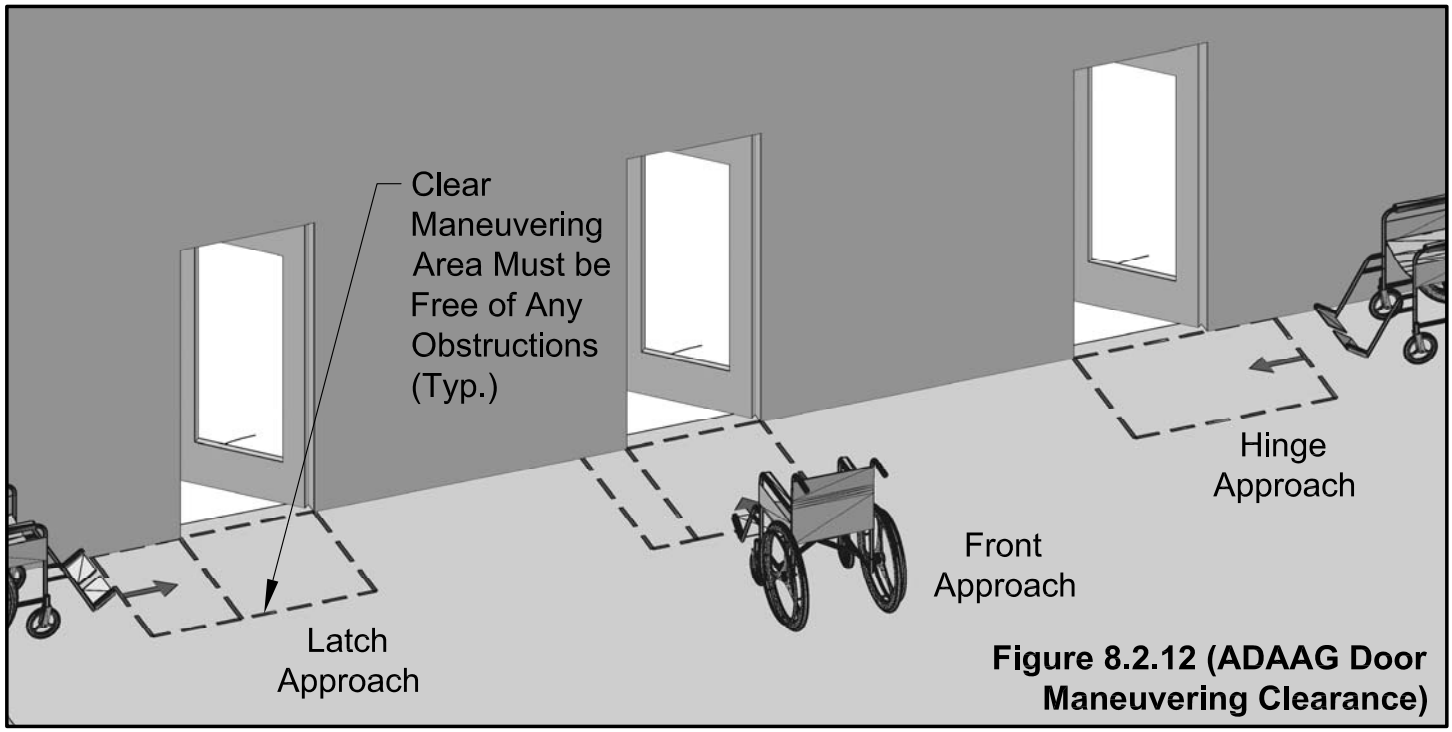


Figure 8.2.12 (ADAAG Door Maneuvering Clearance)

8.2.4 Bus Stops

When altering the existing sidewalks or curb ramps at or near bus stops, access cannot be reduced. At a minimum, the existing alighting area at a bus stop area must be maintained accessible to provide a clear area dedicated for the pedestrians exiting the bus. PROWAG identifies the features of an accessible bus stop alighting area:

Surface

Bus stop boarding and alighting areas shall have a firm, stable, and slip resistant surface.

Dimensions

Bus stop boarding and alighting areas shall provide a clear length of 8 feet minimum, measured perpendicular to the curb or street or highway edge, and a clear width of 5 feet minimum, measured parallel to the street or highway.

Connection

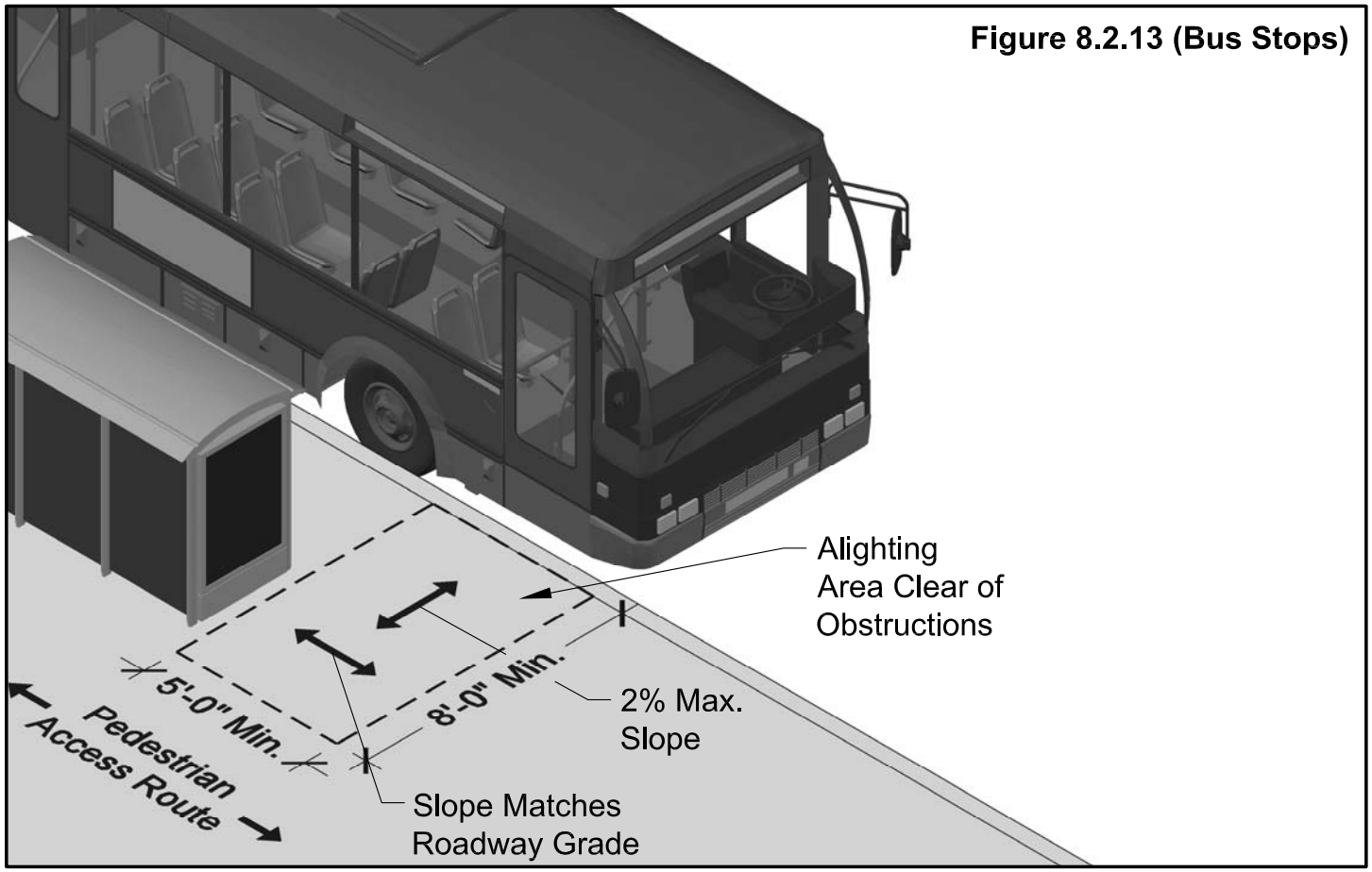
Bus stop boarding and alighting areas shall be connected to streets, sidewalks, or pedestrian paths by a pedestrian access route (Refer to Section 2.0).

Grade

Parallel to the street or highway, the grade of the bus stop boarding and alighting area shall be the same as the street or highway. Perpendicular to the street or highway, the grade of the bus stop boarding and alighting area shall not be steeper than 2%.

Note: Coordination with transit agencies or providers may be necessary for work at or near a bus stop location.

Figure 8.2.13 (Bus Stops)



8.2.5 Clear Floor Space & Reach Ranges

When making improvements in the public way, a pedestrian's ability to access or use existing facilities including but not limited to public pay phones, newspaper dispensers, call buttons, and benches must not be reduced. In new construction, these facilities would be required to be located in a manner that provides a clear floor or ground space adjacent to the element, allowing for access. Additionally, any operable part of the facility, such as a button or a lever, would be required to be located to allow for access by a pedestrian in a wheelchair. The following is a summary of these accessibility as called for in ADAAG/PROWAG:

Clear Floor Space

- General: The clear floor or ground space must satisfy the requirements of an accessible route (refer to Section 2.0 for additional information).
- Slope: The slope of the clear floor or ground surface shall not exceed 1:48.
- Dimensions: The clear floor or ground space shall be 30 inches minimum by 48 inches minimum. This clear space may utilize allowable knee and toe clearance space for pedestrians using a wheelchair (refer to ADAAG).
- Position: The clear floor or ground space shall be positioned for either forward or parallel approach to an element. (Figures 8.2.14, 8.2.15)
- Approach: One full unobstructed side of the clear floor or ground space shall join an accessible route or adjoin another clear floor or ground space.
- Maneuvering Clearance: Where a clear floor or ground space is located in an alcove or otherwise confined on part of three sides, additional maneuvering clearance shall be provided (refer to ADAAG).

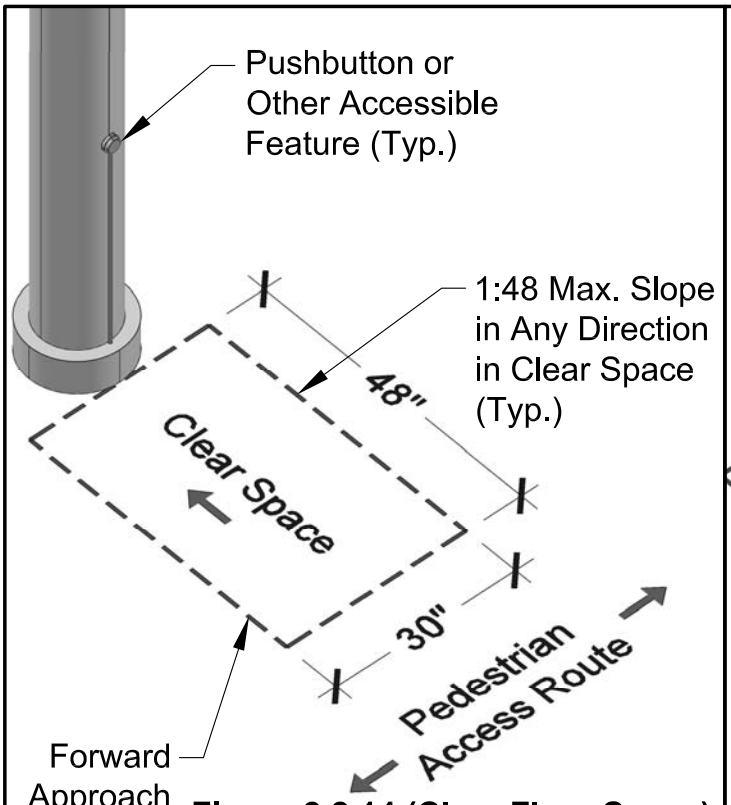
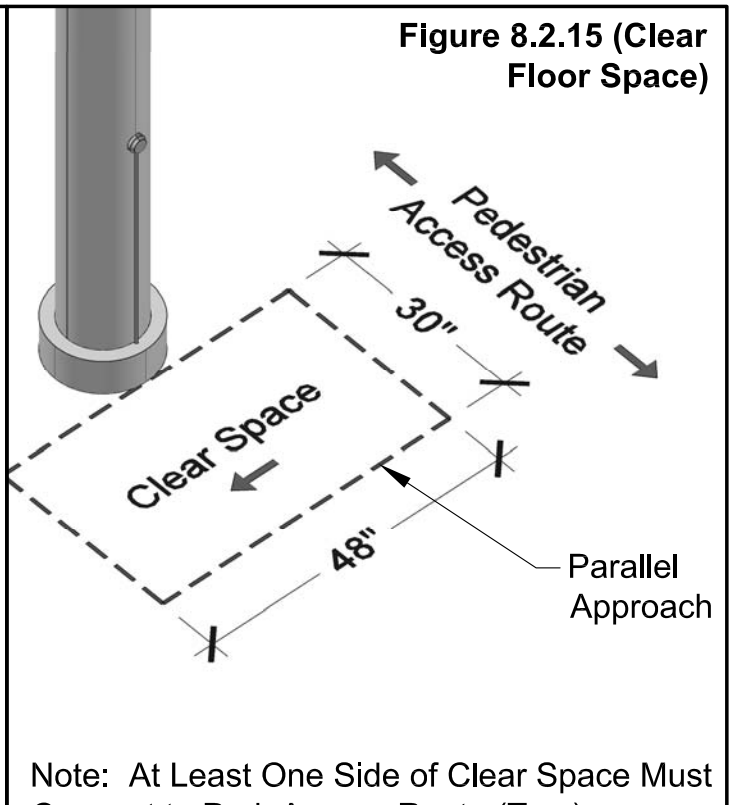


Figure 8.2.14 (Clear Floor Space)



Note: At Least One Side of Clear Space Must Connect to Ped. Access Route (Typ.)

Figure 8.2.15 (Clear Floor Space)

8.2.5 Clear Floor Space & Reach Ranges (cont.)

In addition to providing a clear space that allows access to an element when altering the public way, it is also necessary to maintain access to the operable parts of those elements. The operable parts cannot be left in a less accessible location. In new construction, the operable parts of a device are required to be in an accessible location, within a given reach range. ADAAG/PROWAG offer the following regarding reach range:

Forward Reach

- Unobstructed Forward Reach: Where a forward reach is unobstructed, the high forward reach shall be 48 inches maximum and the low forward reach shall be 15 inches minimum above the finish floor or ground. (Figure 8.2.16)

- Obstructed Forward Reach: Where a high forward reach is over an obstruction, the clear floor space shall extend beneath the element for a distance not less than the required reach depth over the obstruction. The high forward reach shall be 48 inches maximum where the reach depth is 20 inches maximum. Where the reach depth exceeds 20 inches, the high forward reach shall be 44 inches maximum and the reach depth shall be 25 inches maximum. (Figures 8.2.17, 8.2.18)

Figure 8.2.17 (Obstructed High Forward Reach)

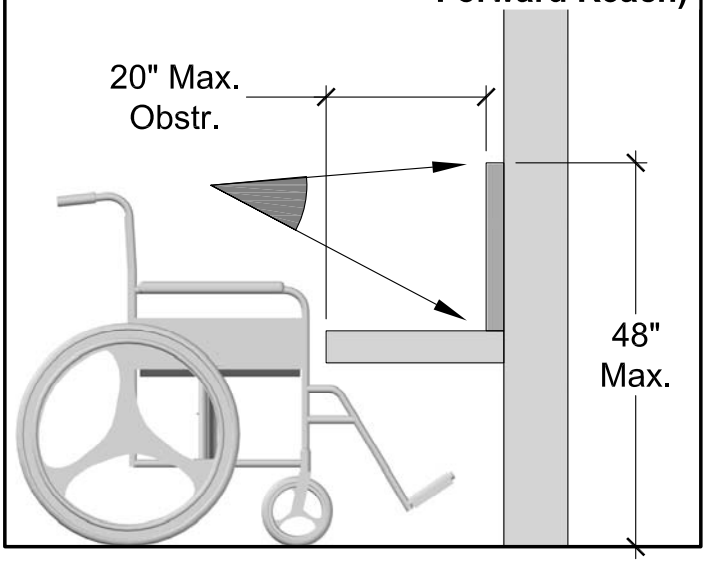


Figure 8.2.16 (Unobstructed Forward Reach)

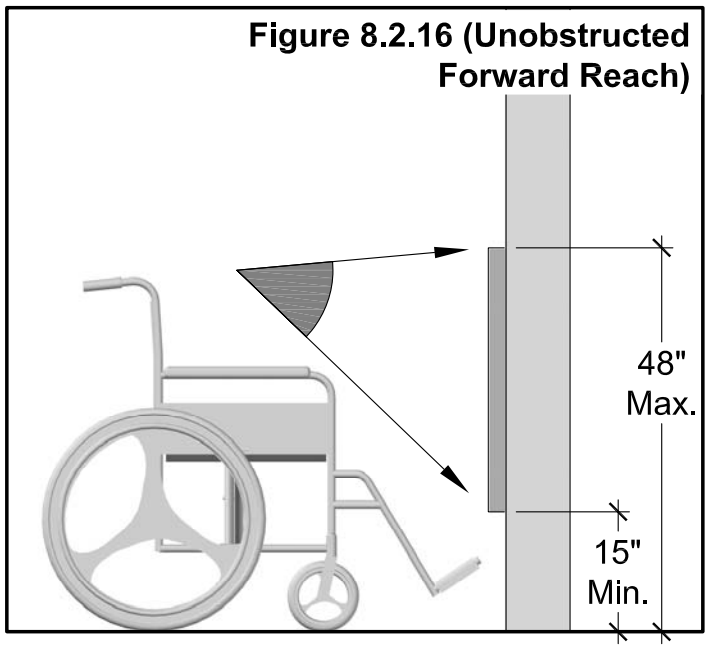
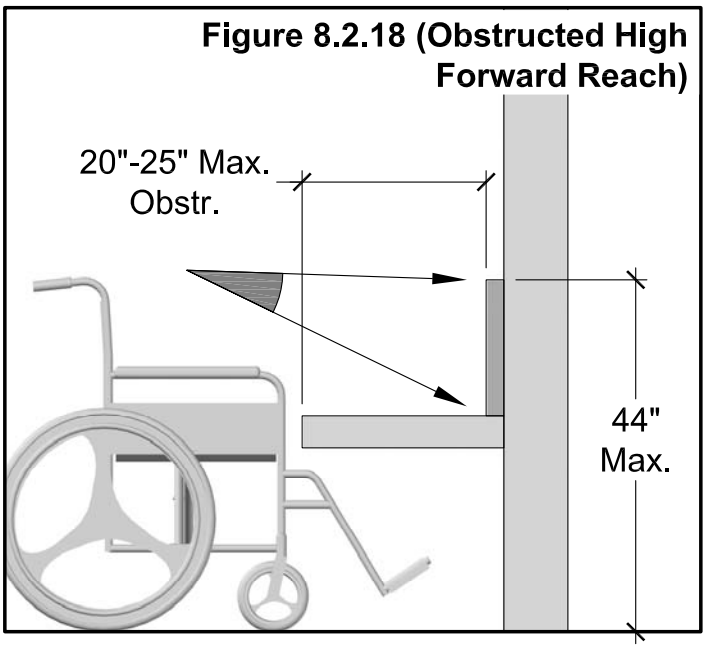


Figure 8.2.18 (Obstructed High Forward Reach)



8.2.5 Clear Floor Space & Reach Ranges (cont.)

Side Reach

- Unobstructed Side Reach: Where a clear floor or ground space allows a parallel approach to an element and the side reach is unobstructed, the high side shall be 48 inches maximum and the low side reach shall be 15 inches minimum above the finish floor or ground.
EXCEPTION: An obstruction shall be permitted between the clear floor or ground space and the element where the depth of the obstruction is 10 inches maximum.
(Figure 8.2.19)
- Obstructed Side Reach: Where a clear floor or ground space allows a parallel approach to an element and the high side reach is over an obstruction, the height of the obstruction shall be 34 inches maximum and the depth of the obstruction shall be 24 inches maximum. The high side reach shall be 48 inches maximum for a reach depth of 10 inches maximum. Where the reach depth exceeds 10 inches, the high side reach shall be 46 inches maximum for a reach depth of 24 inches maximum. (Figures 8.2.20, 8.2.21)

Operable Parts

- Clear Floor Space: A clear floor or ground space shall be provided (refer to page 140).
- Height: Operable parts shall be placed within one or more of the reach ranges specified.
- Operation: Operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5 pounds maximum.

Figure 8.2.20 (Obstructed High Side Reach)

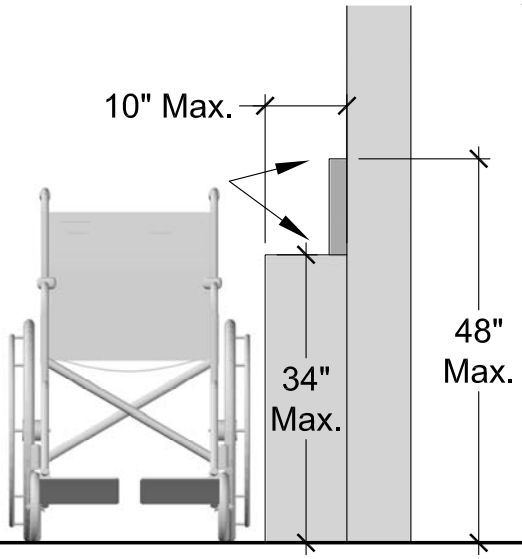


Figure 8.2.19 (Unobstructed Side Reach)

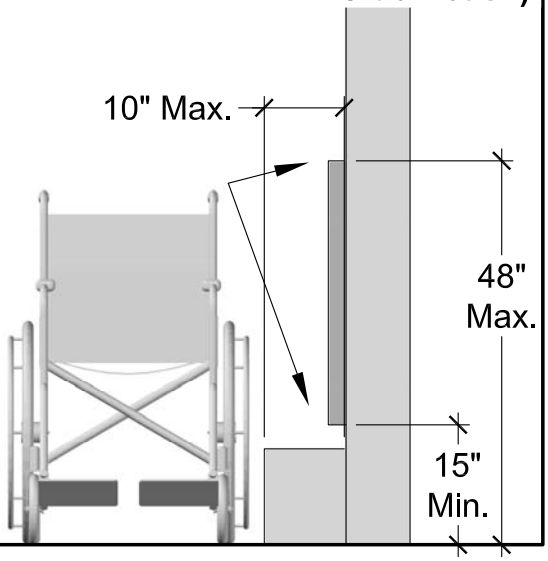
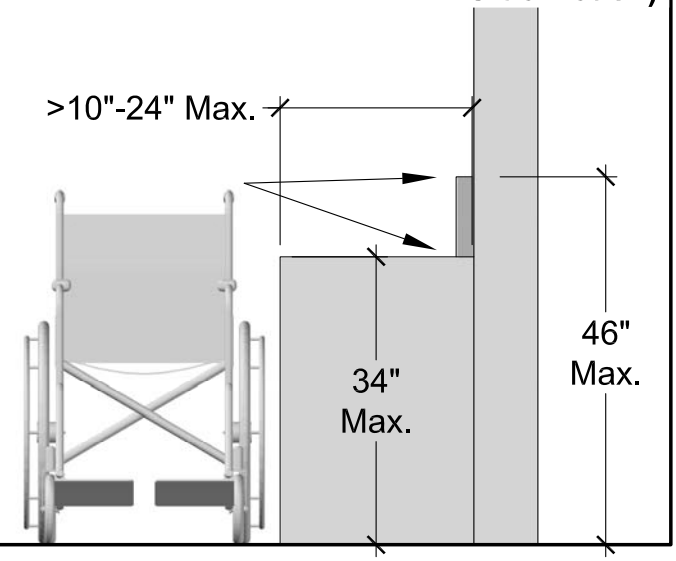


Figure 8.2.21 (Obstructed High Side Reach)



8.3 Miscellaneous - Special Conditions

8.3.1 Vaulted Sidewalks

A 'vaulted sidewalk' is generally described as a structure that occupies a space beneath the surface of the sidewalk. Because of the way the streets and sidewalks have been built up over time in particular areas, some unique situations have resulted, including vaulted sidewalks. Some sidewalks may have been built above old freight tunnels and shafts, with their structural compositions still intact and perhaps still in use at some capacity. Another example of vaulted sidewalks include utility structures where equipment may be operated or stored. Other vaulted sidewalks may actually serve as part of a basement of an adjacent building; there may exist businesses or other functions within these vaulted sidewalks. Where the subway runs through the Central Business District (CBD), it is not uncommon for vent shafts or other subway related structures to be located under the sidewalk.

Because vaulted sidewalks are a common occurrence in urban areas, particularly in the CBD, there may exist difficult challenges in improving existing sidewalks and curb ramps to the accessibility requirements. The top of these vaulted structures may, in fact, serve as the pedestrian surface itself. Although each vaulted sidewalk case should be analyzed on a case-by-case basis, it may be difficult to include the reconstruction of a vaulted sidewalk to a scope of work that only involves minor work to a sidewalk or curb ramp. Modifying these vaulted structures, particularly those that are occupied and used spaces, can become extremely expensive, time consuming, and intrusive on an potential occupants of the space. A structural engineer and a permit may be required to perform any work on a vault.

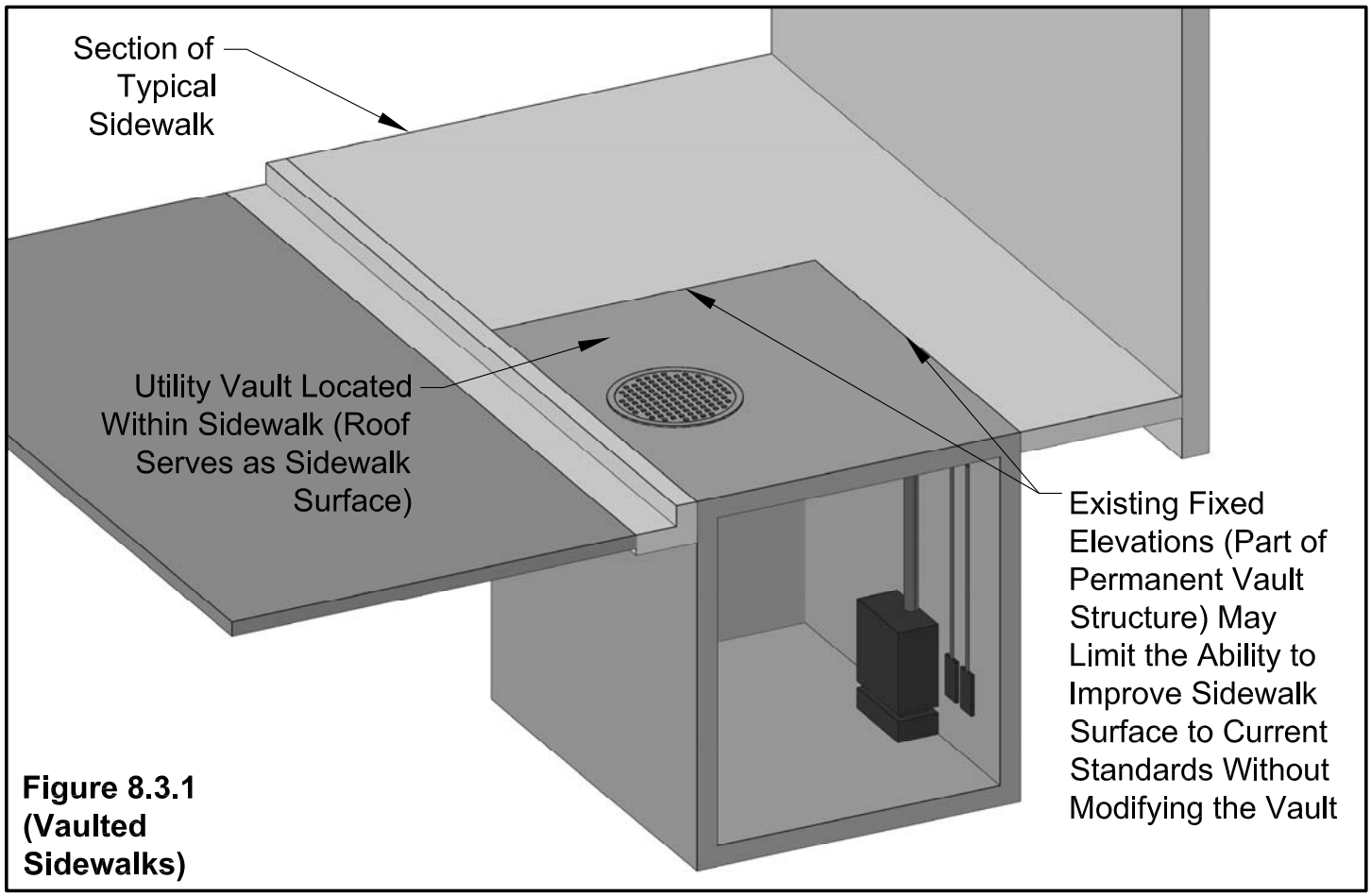


Figure 8.3.1 (Vaulted Sidewalks)

8.3.2 Pavement Raises

When the elevation between existing design control points at an intersection are substantially different, it may be necessary to propose raising the pavement in order to provide the maximum allowable slopes for a curb ramp or sidewalk. Depending on the elevation at the crown of the roadway and the existing street drainage pattern, a pavement raise of 2 inches or 3 inches could be considered reasonable.

Existing conditions may be such that only a substantial pavement raise will allow for the installation of compliant curb ramps and/or sidewalks. (Figure 8.3.2.) Due to the narrow sidewalks, the preferred standard perpendicular ramps cannot fit and the existing facility entrance eliminates the possibility of utilizing a blended transition design.

The flow of traffic and drainage should not compromised to provide an accessible way. Raising the elevation at only corner of the intersection may not be feasible. Under such circumstances it may be prudent to defer any improvement to a project in the future with a large scope of work (street resurfacing, streetscape) that can alter the elevation of the street to provide an accessible street crossing and connection to the sidewalk.

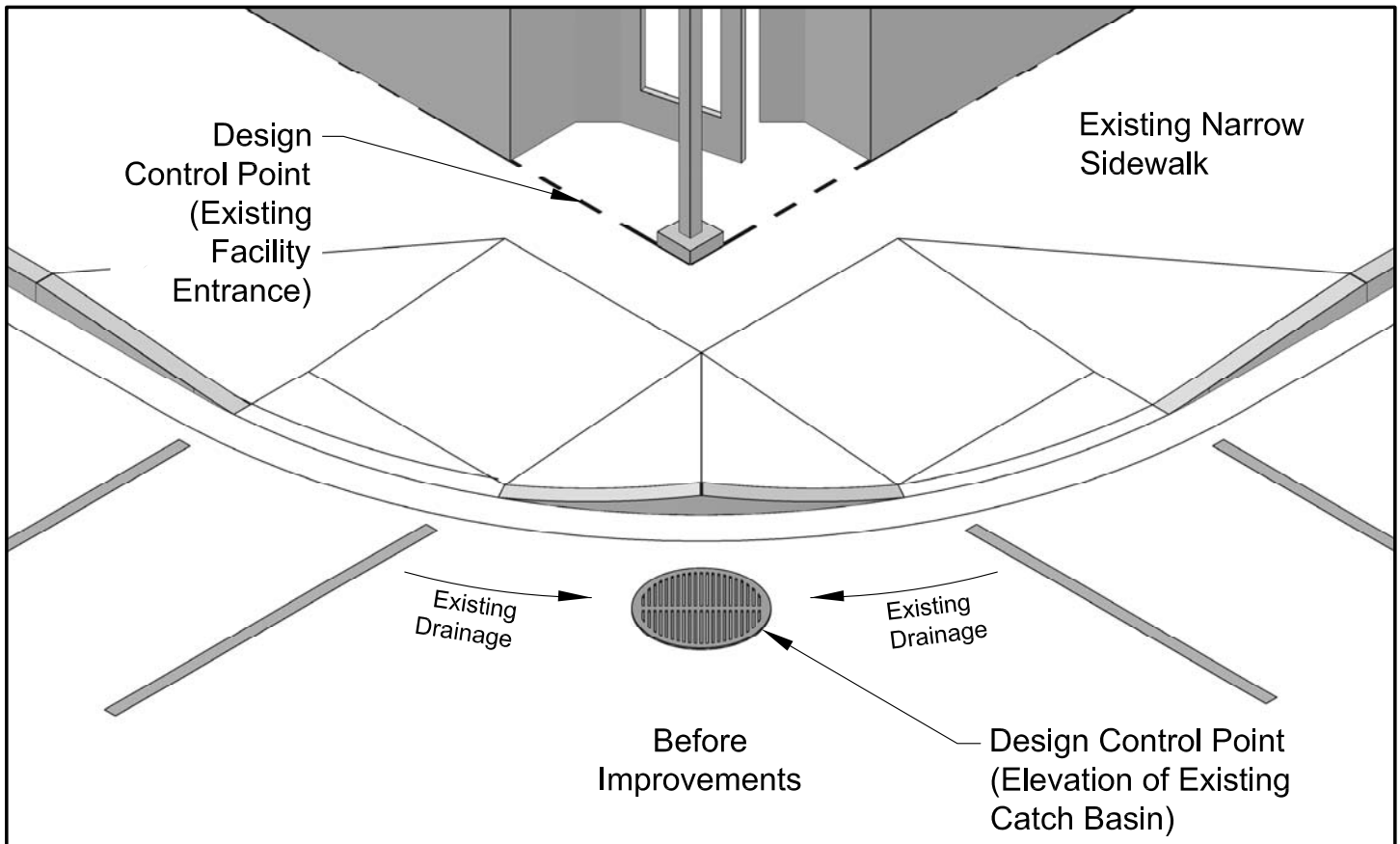


Figure 8.3.2 (Pavement Raises)

8.3.3 Specialty Sidewalks

Special sidewalk conditions may exist that warrant extra design consideration when improving a curb ramp or sidewalk. These special conditions include, but are not limited to, unique sidewalk surfaces, paver units installed in the parkway, and courtesy walks located adjacent to the curb line at parkway locations.

Sidewalk Surfaces

Non-standard sidewalk surfaces are at times installed the public way. Typically used for ornamental reasons, these specialty surfaces include granite, marble, textured sidewalks, colored sidewalks, and any other special finish sidewalks.

The challenges in attempting an alteration within these specialty sidewalk areas may include:

- Coordination with the owner of the building that maintains the specialty sidewalk.
- Locating the material in which to build compliant sidewalks and curb ramps that match the existing conditions.
- Reuse of existing material, such as granite, is not typically an option as the pieces are quarried in specific shapes that have resulted in steep slopes or other conditions not satisfying current ADA requirements.
- The cost of locating or producing new specialty material for the alterations can increase the cost of typical sidewalk improvements.

Note: The requirement for detectable warning at the curb ramp or sidewalk remains no matter what surface used. The detectable warning surface is required to contrast visually with the specialty surface.

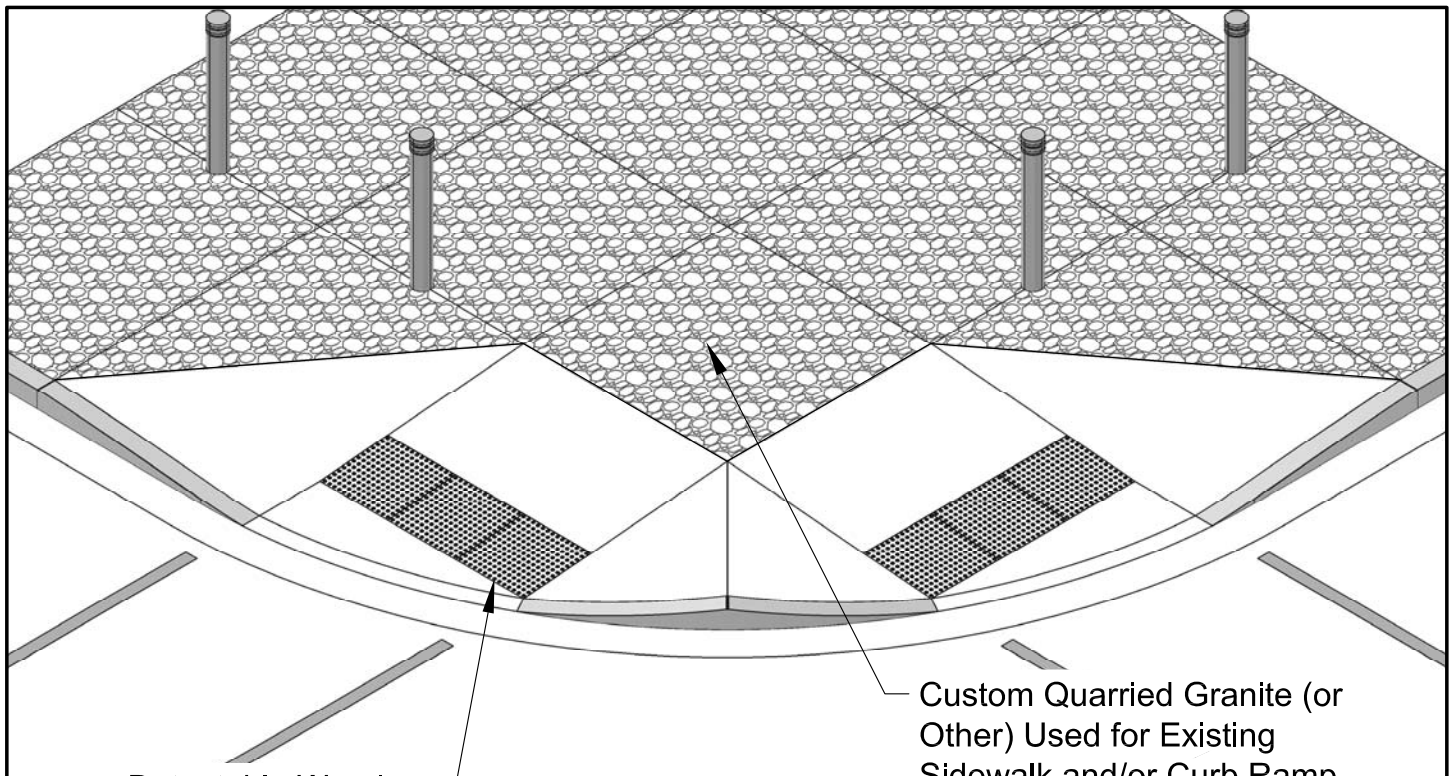


Figure 8.3.3 (Specialty Sidewalks)

8.3.3 Specialty Sidewalks (cont.)

Paver Units in Parkway

Some locations throughout the City include a portion of the landscaped parkway that is paved. Sometimes the paved parkway is typical concrete, and at other times the surface may consist of asphalt, brick paver units, or other materials. This paved parkway is typically able to be walked on like any concrete sidewalk surface.

When a curb ramp is installed adjacent to a paved parkway, a typical ramp side flare should be installed to avoid the potential threat of a tripping hazard. (Figure 8.3.4) Brick pavers are a hard surface that could be interpreted as a pedestrian friendly circulation route.

At times, due to existing conditions, it may prove difficult to provide a side flare because of the configuration or the layout of the paver units. The paver units may in fact be a large precast slab with a texture molded on the top to resemble smaller, individual paver units. It may not be possible to cut into the panel to provide a ramp side flare because of these existing conditions.

A side curb or vertical treatment should not be used adjacent to a hard pedestrian surface without approval. It may be determined that existing landscaping or street furniture within the parkway protect pedestrians from a tripping hazard and a ramp side curb could be utilized. (Figure 8.3.5)

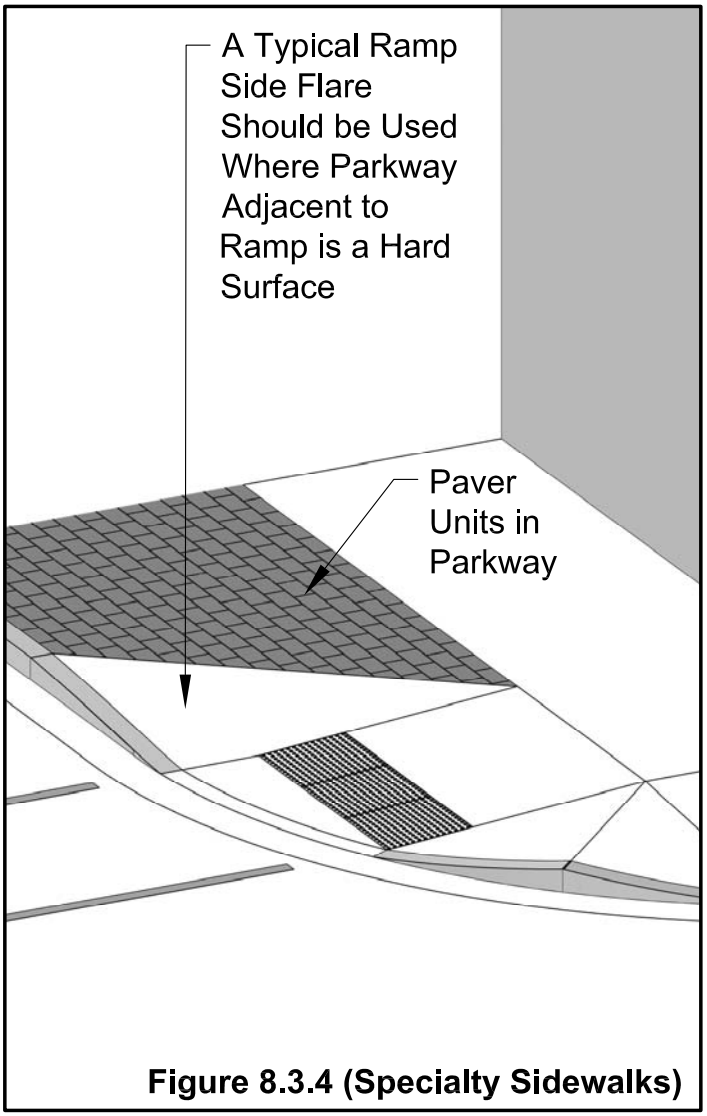


Figure 8.3.4 (Specialty Sidewalks)

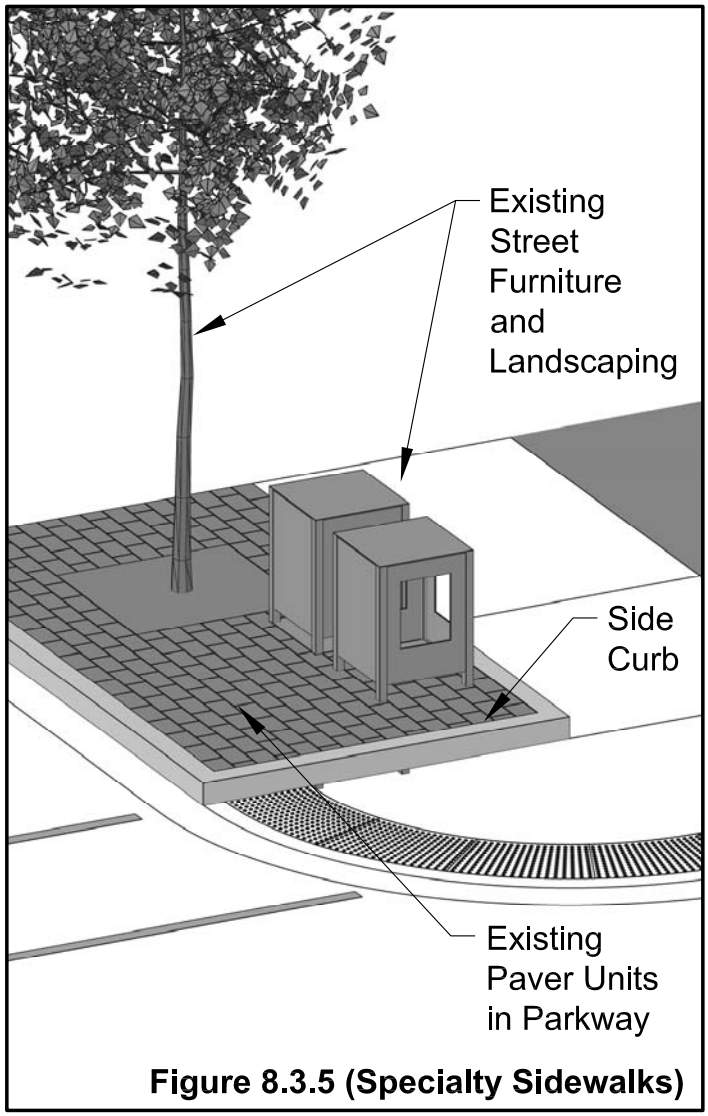


Figure 8.3.5 (Specialty Sidewalks)

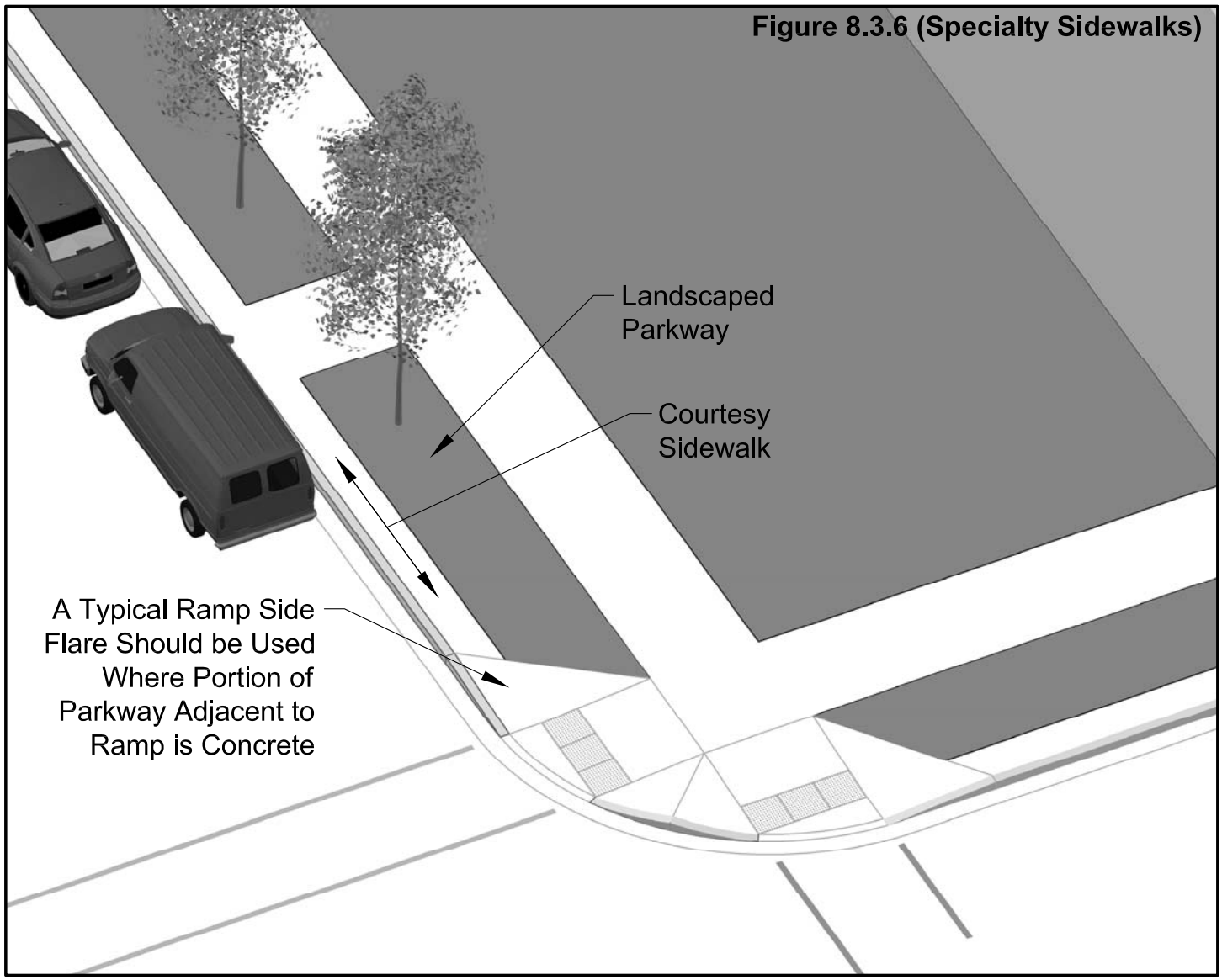
8.3.3 Specialty Sidewalks (cont.)

Courtesy Sidewalks

Existing sidewalks that are located directly adjacent to the curb in an otherwise landscaped parkway are known as courtesy sidewalks or carriage sidewalks. These typically narrow sidewalks (1 or 2 feet in width) are intended to provide a walkway for those exiting their vehicles that connects to the main sidewalk.

While existing courtesy sidewalks may be narrow and not designed to be accessible with the minimum width of 4 feet applied, it is advised that the transition to these walkways be treated similar to typical sidewalks when performing improvements to curb ramps and sidewalks. A typical ramp side flare or transition should be applied to avoid creating a tripping hazard where the new sidewalk or curb ramp and the courtesy sidewalk meet, whether or not the courtesy sidewalk is part of the accessible pedestrian access route or not. (Figure 8.3.6)

Figure 8.3.6 (Specialty Sidewalks)



8.4 Miscellaneous - Technically Infeasible

As stressed throughout these guidelines, alterations made to the public way must result in compliant and accessible sidewalks, curb ramps, and street crossings. Legally, every municipality, county, state, and federal jurisdiction that oversees construction is obligated to provide accessibility for all new or altered facilities. Specific to alterations, it is mandatory that the requirements of accessibility be applied to the maximum extent feasible.

The U.S. Department of Justice and the U.S. Department of Transportation, responsible for enforcing the ADA, do not recognize the cost of an alteration to be the factor of determining what is technically infeasible.

For a proposed alteration to be declared technically infeasible, as defined by ADAAG, there must be significant complications that preclude the alteration. If existing structural conditions would require removing or altering a load-bearing member which is an essential part of the structural frame or if other existing physical or site constraints prohibit modification or addition of compliant elements, spaces, or features, the alteration may be deemed technically infeasible.

Occasionally a project may involve elements that are structurally integral to the sidewalk or curb ramp. For example, the sidewalk that travels through a viaduct may be a part of the viaduct structure itself. Although every case must be carefully analyzed case-by-case, it may not be possible to improve a sidewalk that is structurally integral with a viaduct without modifying the entire viaduct structure and/or foundation. The options for sidewalk improvement may be limited in a case such as this.

Designers or construction professionals must provide analysis and data to determine if an improvement for accessibility is infeasible. If it is determined that existing site constraints prohibit a final product that is fully accessible, the decision to forego the full improvement must be well documented. The reasoning and documentation must be sound. This documentation may include verbal descriptions, existing survey information, photographs, and any other material that would corroborate the decision to declare the alteration technically infeasible.

If it is determined that the originally designed and planned alteration aimed at providing full accessibility is not technically feasible, some improvement must be made. This improvement must provide a level of accessibility to the maximum extent feasible. If no improvement at any level is feasible and accessibility cannot be provided, an alternate path should be identified and provided if possible.

9.0 Scope of Work

9.1 Scope of Work - Overview

The scope of work for a given project will determine the level of improvements necessary in provision of accessibility. Alterations in the public way in Chicago that affect pedestrian circulation must provide accessibility levels dictated by *Appendix B - Requirements for Openings, Construction and Repair in the Public Way - ADA Standards.* While there are some clarifications and exceptions described in this Section, the general rule of thumb to follow is: what is removed must be replaced in a compliant way.

Projects of varying scopes are evident in the public way, ranging from minor asphalt patching to complete roadway reconstruction. The provision of accessibility generally mimics the breadth of the scope of work. When planning the project scope, pedestrian accessibility should be analyzed and made to fit the intentions and limits of the project. For example, a minor asphalt patching job is not intended to do anything more; there is no requirement to extend the scope to include sidewalk or curb ramp improvements.

The U.S. Access Board publication, *Special Report: Accessible Public Rights-of-Way - Planning and Designing for Alterations* (2007), describes what is called the '4R's' that help illustrate differing scope of work limits:

- Reconstruction: A reconstruction project involves a large scope-of-work that may include removing and replacing the entire roadway and sidewalk system. Provision of full accessibility is expected with this type of project.
Examples: Roadway reconstruction, streetscape projects, bridge reconstruction, etc.

- Rehabilitation: A rehabilitation project may not include the complete rebuilding of the roadway, but would involve significant work to a portion of a roadway and subgrade features. Provision of accessibility would be determined by the scope of work analyzed case-by-case.
Examples: Drainage improvements, traffic signal modernization, water main replacement.

- Restoration: A restoration project typically involves surface improvements. Because of the improved or replaced surfaces of the roadway (pedestrian crossing) and/or the sidewalks, accessibility provision is typically a requirement.
Examples: Replacing damaged sections of roadway, sidewalks, or curb ramps.

- Resurfacing*: Any street resurfacing project that includes an intersection automatically triggers the requirement to improve the existing curb ramps and connection to the sidewalks. Minor patchwork and limited resurfacing jobs may not necessary require accessibility improvements.

* Street resurfacing triggers improvements to the associated curb ramps per Title II of the Americans with Disabilities Act.

Beyond the obvious triggers such as street resurfacing and the alteration of existing sidewalks and curb ramps, provision of accessible features will rely on the scope of work for a given project.

It is an important duty of the designers and those that construct sidewalks and ramps to carefully analyze the existing conditions within the given scope of work for the project. Existing accessible and compliant features need not be removed if they can remain in place without hindering the necessary improvements within the scope.

9.2 Scope of Work - Sidewalks

To clarify the necessary improvements where sidewalk alterations occur, the following will apply.

Alterations 10 Feet or Greater

Any alteration that involves removal and replacement of greater that a 10 foot length of sidewalk requires an improvement of the sidewalk to an accessible level.

If, due to existing site constraints, the entire width of the sidewalk cannot be replaced at 1:64 maximum cross slope, a minimum of a 4 foot wide pedestrian access route must be provided (refer to Section 2.0 for additional information). The entire length of the alteration must contain an accessible route at a minimum, and each side of the alteration must be appropriately transitioned to the existing sidewalk (minimum of 5 foot length transition - refer to Section 8.1 for additional information). (Figure 9.2.1)

Alterations Less Than 10 Feet

If the work performed in the public way encounters less than a 10 foot long section, it is acceptable to replace the sidewalk back to its existing condition. (Figure 9.2.2)

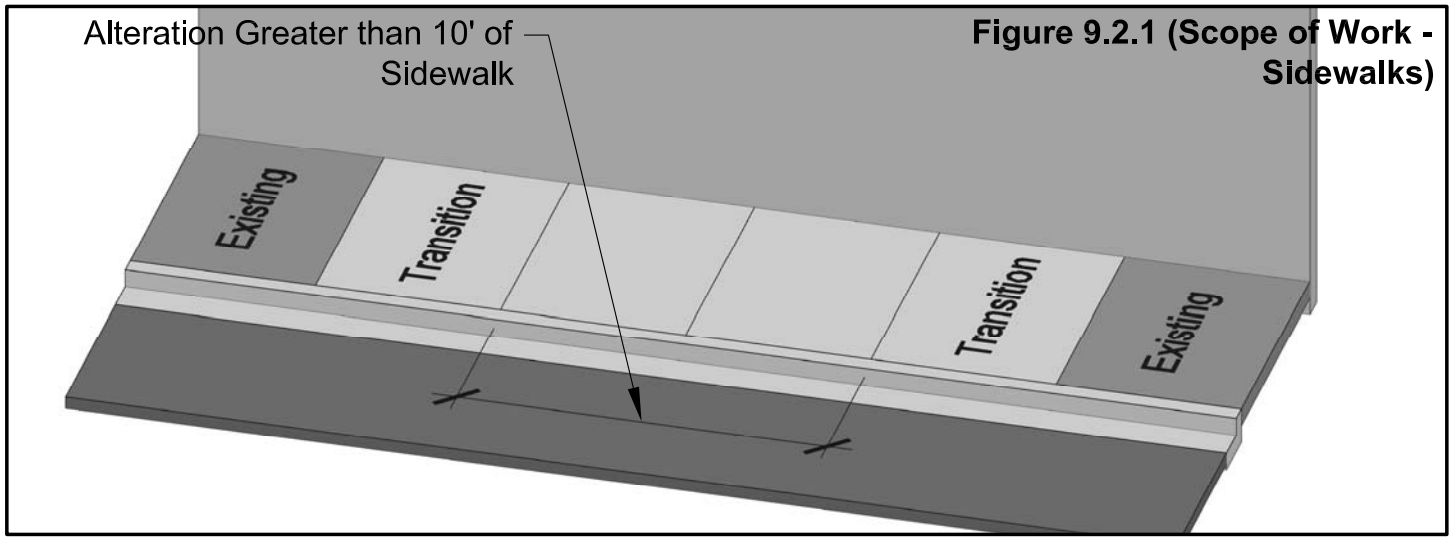


Figure 9.2.1 (Scope of Work - Sidewalks)

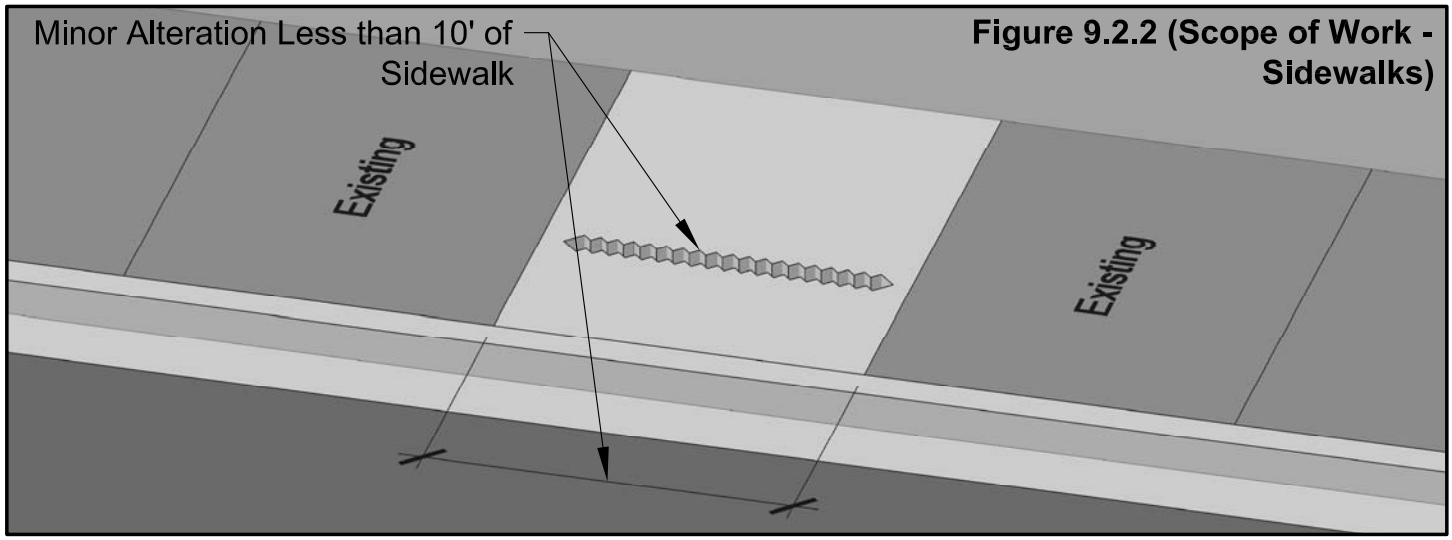


Figure 9.2.2 (Scope of Work - Sidewalks)

9.3 Scope of Work - Curb Ramps

To clarify the necessary improvements where sidewalk and/or roadway alterations occur will apply:

Resurfacing

Any resurfacing project that includes work within 4 feet of a crosswalk requires that the associated curb ramps are improved to the current standards.

If the resurfacing of the roadway encounters less than 1/4 of the width of the roadway, it is acceptable to exclude the curb ramp improvements.
(Figure 9.3.1)

Sidewalk

Where any alteration to the sidewalk includes the removal and replacement of any part of the existing curb ramp, curb ramp improvements are required.

Any alteration to the sidewalk including the removal and replacement of sidewalk abutting an existing curb ramp and/or curb ramp landing requires curb ramp improvements. (Figure 9.3.2)

Single Corner

If the scope of work for a project involves removal and replacement at only one corner of the intersection, it is preferred but not required to improve other corners of the intersection.

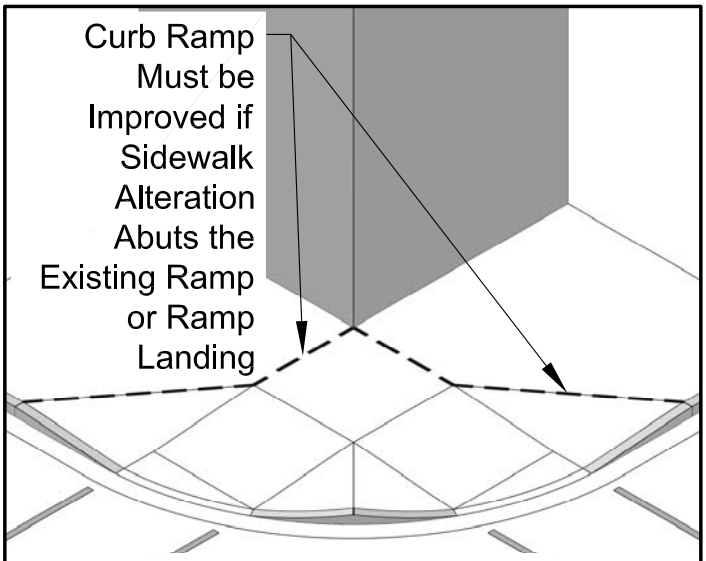


Figure 9.3.2 (Scope of Work - Curb Ramps)

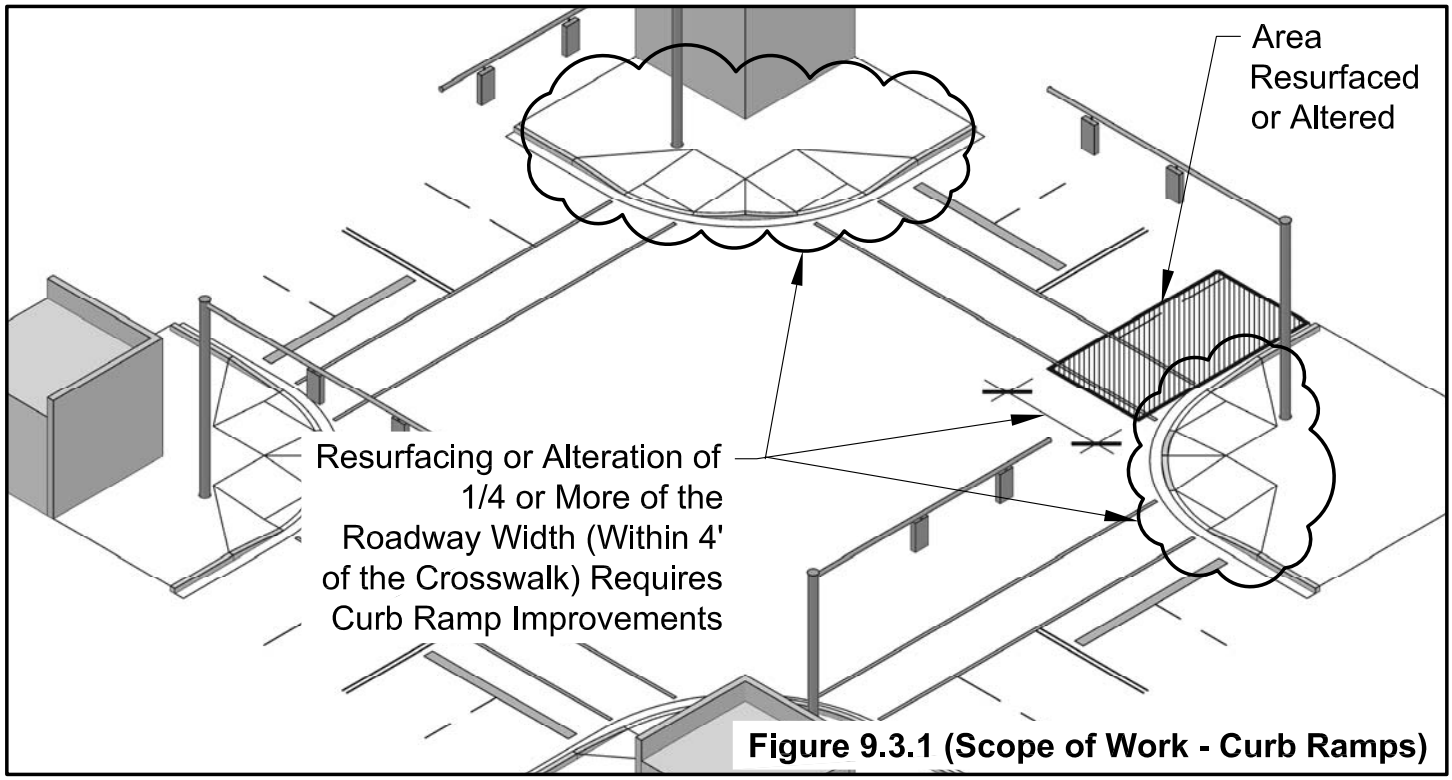


Figure 9.3.1 (Scope of Work - Curb Ramps)

9.4 Scope of Work - Alleys

To clarify the necessary improvements where alterations to alleys occur, the following will apply:

Alleys

Any project that includes work within an existing alley apron requires that the associated curb ramps and/or sidewalks abutting the alley apron be improved to the current standards (as well as providing the accessible alley crossing).
(Figure 9.4.1)

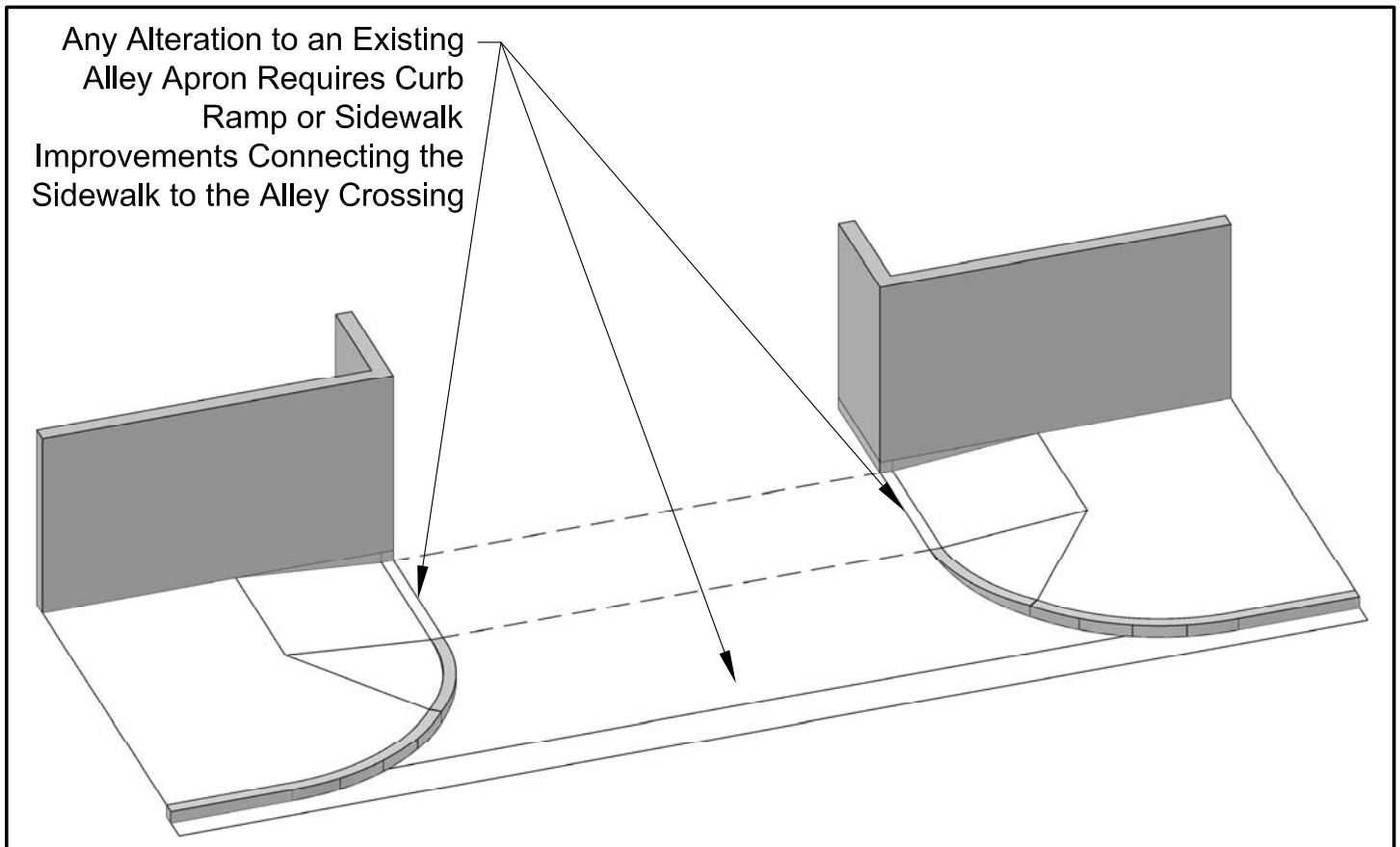


Figure 9.4.1 (Scope of Work - Alleys)

10.0 Accessibility Checklist

10.1 Quick Accessibility Checklist - Curb Ramps & Sidewalks

Curb Ramps

	Compliant	Not Compliant
1 **Curb Ramp Running Slope** 1:14 Maximum Slope	☐	☐
2 **Curb Ramp Cross Slope** 1:64 Maximum Slope	☐	☐
3 **Curb Ramp Width** 4' Minimum Width (6' Pref.)	☐	☐
4 **Curb Ramp Landing** 4' Minimum Depth, Matches Width of Curb Ramp	☐	☐
5 **Curb Ramp Side Flares** 1:12 Maximum Slope (where applicable)	☐	☐
6 **Detectable Warning** 2' Minimum Depth, Matches Width of Curb Ramp at Base of Ramp	☐	☐
7 **Transitions to Adjacent Surfaces** Vertical Transitions 1/4" Max., Gaps 1/2" Max.	☐	☐
8 **Counterslope** 1:24 Maximum Slope	☐	☐
9 **Marked Crossing** Ramp Falls within Provided Markings (where applicable)	☐	☐
10 **Existing Facilities** Access not Reduced (where applicable)	☐	☐

Sidewalks

	Compliant	Not Compliant
1 **Sidewalk Running Slope** 1:24 Maximum Slope	☐	☐
2 **Sidewalk Cross Slope** 1:64 Maximum Slope	☐	☐
3 **Sidewalk Slope Where Turning Required** 1:64 Maximum Slope in all Directions (where applicable)	☐	☐
4 **Sidewalk Clear Width** 4' Minimum Width (6' Pref.)	☐	☐

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Note: This checklist may not represent a complete list for all related curb ramp and sidewalk checks necessary for full compliance. This checklist is meant to be tool that can be used as a quick reference when checking for some of the key accessibility requirements at curb ramp and sidewalk locations.

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Perpendicular Ramps: Preferred ramps applied at an intersection. One side full width concrete sidewalk; other side abuts parkway.

Perpendicular Ramps: Preferred ramps applied at intersection. Side curbs used at edges of the ramps because the adjacent surface is not a pedestrian surface (parkway).

Perpendicular Ramps: Preferred ramps applied at an intersection. Accessible route maintained past existing barriers (fencing at outdoor cafe). Accessibility to existing facility (restaurant) maintained.

Perpendicular Ramp: One-way perpendicular ramp applied at intersection. Side flare acts as a cue to help orient the blind and visually impaired (detectable warning tile alignment perpendicular at ramped surfaces). Ramp not provided where pedestrian crossing is not available.

Blended Transitions (Both Photos): Blended transition designs applied due to narrow sidewalks and sidewalk geometry (offset from parkway). Note: Manhole preferably located away from the ramp or ramp landing surface if possible (top photo); manhole lid must be compliant if located in the accessible route.

Blended Transition: Blended transition design applied due to narrow sidewalk, sidewalk geometry (sidewalks of differing width), and small curb radius. Note: Manhole preferably located away from crosswalk surface if possible; manhole lid must be compliant if located in the accessible route.

Blended Transition: Blended transition design applied due to large curb radius and atypical intersection geometry.

Blended Transition: Blended transition designed applied due to sidewalk geometry (sidewalks of differing widths).

Blended Transition: Blended transition design applied due to limited available right-of-way. Note: sections of straight tile used if the available detectable warning tile radii cannot be applied to the design).

Combination Ramp: Combination ramp design applied due to large elevation difference from sidewalk to street elevation. Note: Manhole preferably located away from ramp or ramp landing surface if possible.

Combination Ramp: (Photo above of same combination ramp)

Combination Ramp: Combination ramp design applied due to limited available right-of-way and large elevation difference between sidewalk and street elevation. Ramp widths reduced to 4' minimum to maximize ramp running slope.

Parallel Ramps: Parallel ramp design applied due to limited available right-of-way at a tee-intersection crossing. Back curb applied adjacent to landscaped area.

Median (Pedestrian Refuge): Typical cut-through refuge with detectable warning each side.

Channelization Median: Cut-through refuge with detectable warning at each location where the pedestrian access route abuts the vehicular way. Note: Align the cut-through and detectable warning surface as close as possible to the orientation of the crosswalk and the adjacent vehicular way.

Midblock Ramps: Perpendicular ramps lead down midblock pedestrian crossing. Due to specialty sidewalk surface (dark material, near side of photo), light-colored detectable warning tile provided to satisfy contrast requirements. Note: Proposed midblock crossings must be approved.

Tee Intersection: Perpendicular ramps lead down to pedestrian crossing at tee-shaped intersection.

Alley: Pedestrian access route provided at alley crossing (with returned curbs) and connects to each abutting sidewalk. Note: Detectable warning not provided at alleys.

Driveway: Pedestrian access route provided at driveway crossing (with flared sides) and connects to each abutting sidewalk. Note: Detectable warning not provided at non-signalized driveways.

Utility in Ramp: If existing utility cannot be removed from the surface of the ramp improved, the surface of the utility structure lid must comply with the requirements of an accessible route.

Tile Alignment: Detectable warning surface fit to back-of-curb where the setback to the bottom-of-ramp exceeds 5'-0".

Creative Solutions (Bump-Out): Bump-out design applied due to limited available right-of-way. Drainage structure location maintained. Existing traffic pattern undisturbed.

Creative Solutions (Bump-Out): (Additional photo of same bump-out)

Creative Solutions (Diverging Sidewalks): Diverging sidewalks (one high, one low) provided due to lack of available right-of-way and elevation difference between sidewalk at existing facility entrances and street below.

Creative Solutions (Diverging Sidewalks): (Additional photo of same diverging sidewalks)

Creative Solutions (Alternate Route): Alternate route provided due to lack of available right-of-way and elevation difference between sidewalk at existing facility entrances and street below. Note: Stairs provided for direct access for those not using the accessible route.

Creative Solutions (Alternate Route): (Additional photo of same alternate route)

Creative Solutions (Ramped Sidewalk): Ramps provided due to lack of available right-of-way and **extreme elevation difference** between sidewalk and street below. Note: Stairs provided for direct access for those not using the accessible route.

Creative Solutions (Ramped Sidewalk): (Additional photo of same ramped sidewalk)

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