

Pedestrian Accessibility Standards for Facilities in the Public Right of Way

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**Prepared by
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PREFACE

P.1 Abbreviations

AASHTO - American Association of State Highway and Transportation Officials

ADA - Americans with Disabilities Act, 1990

ADAAG - Americans with Disabilities Act Accessibility Guidelines

APS - Accessible Pedestrian Signal

DelDOT - Delaware Department of Transportation

DE MUTCD - Delaware Manual on Uniform Traffic Control Devices

DOJ - US Department of Justice

DWS - detectable warning surface

FHWA - Federal Highway Administration

Max. - maximum value

Min. - minimum value

PAR - pedestrian access route

PAS - DelDOT Pedestrian Accessibility Standards

PCP - pedestrian circulation path

PROWAG - US Access Board's Public Right of Way Accessibility Guidelines 2011 and 2013
(Supplement: Questions and Answers)

ROW - right-of-way

RPE - Request for Practical Exception

SUP - Shared Use Path

USAB - United States Access Board (also known as the Architectural and Transportation Barriers Compliance Board).

USDOT - United States Department of Transportation

2006 Standards - USDOT's ADA Standards for Transportation Facilities, 2006

2010 Standards - DOJ's ADA Standards for Accessible Design 2010

P.2 Definitions

Accessible - a facility in the public right-of-way that complies with the standards in this document as they relate to usability by persons with disabilities.

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

American Association of State Highway and Transportation Officials (AASHTO) - a nonprofit, nonpartisan association representing highway and transportation departments in the 50 states, the District of Columbia, and Puerto Rico. AASHTO serves as a liaison between state departments of transportation and the Federal government. AASHTO is instrumental in providing technical standards and guidance documents that are commonly used for design, construction of highways and bridges, materials, and many other technical areas.

Barrier - physical obstruction that prevents an accessible pedestrian connection between the pedestrian access route at the level of the sidewalk and the level of the pedestrian street crossing.

Blended Transition - a raised pedestrian street crossing, depressed sidewalk corner, or similar connection between the pedestrian access route at the level of the sidewalk and the level of the pedestrian street crossing that has a grade of 5.0% or less. Used as an alternative to a curb ramp where grades are less impactful on the pedestrian connections or curbs are not present at the street crossing.

Code of Federal Regulations or CFR - Federal laws that are codified in to the Code of Federal Regulations typically by title and part such as 28 CFR 35.150. This is read Title 28 Code of Federal Regulations Part 35.150.

Components - the individual parts of a larger system or feature. For example, a typical perpendicular curb ramp has several pedestrian components, such as: landing, ramp, flares, detectable warning surface and counter slope.

Cross Slope - the grade (or slope) that is perpendicular to the direction of pedestrian travel.

Curb Line - a line at the face of the curb that marks the transition between the curb and the gutter, street, or highway.

Curb Ramp - a connection between the pedestrian access route at the level of the sidewalk and the level of the pedestrian street crossing that features a ramp segment that cuts through or is built up to the curb. Curb ramp segments can be perpendicular or parallel, or a combination of parallel and perpendicular ramp segments with slopes in the direction of pedestrian travel that range from more than 5.0% to a maximum of 8.3%. Used as an alternative to a blended transition where curbs or limited transition space are present at the street crossing.

Desired Standards - Threshold dimension or characteristic of a pedestrian feature that is considered the DelDOT benchmark for enhanced accessibility.

Detectable Warning Surface - a standardized tactile surface feature built in or applied to walking surfaces or other elements to warn users of hazards at street crossings along a circulation path.

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

Engineering Judgment - the evaluation of pertinent information available at the time of the design, and the implementation of appropriate principles, standards, guidance, and current best practices related to the applicability, design, operation, and/or installation of public improvements.

Facility - all or any portion of structures, improvements, elements, and pedestrian or vehicular routes located in the public right-of-way. Can also include buildings, structures, improvements, elements that are located outside of the ROW but connected to the pedestrian access route.

Features - the elements that make up the pedestrian circulation path including pedestrian access route components such as sidewalks, curb ramps, crosswalks, among others.

Grade Break - the line where two surface planes with different slopes and grades meet.

Infeasible - determination regarding the inability to complete a planned improvement of a building or a facility. Related to limiting factors that allow little likelihood of the improvement being accomplished in full and strict compliance with the minimum requirements.

Maintenance Activities - activities that are intended to preserve the system, retard future deterioration, and maintain the functional condition of the facility or roadway without changing usability for pedestrians.

Maximum Extent Practicable – departs from the technical requirement only to the extent necessary to address a limiting condition.

Minimum Standards - Threshold dimension or characteristic of a pedestrian feature that is considered the industry benchmark for accessibility.

Negative Impact - An alteration or treatment that decreases or has the effect of decreasing the existing accessibility of a pedestrian facility or feature, violating current minimum standards

Operable Part - a component of an element used to insert or withdraw objects, or to activate, deactivate, or adjust the element.

Pedestrian Access Route - a continuous and unobstructed path of travel provided for pedestrians with disabilities within or coinciding with a pedestrian circulation path.

Pedestrian Circulation Path - a prepared exterior or interior surface provided for pedestrian travel in the public right-of-way, typically extending from the back of curb to the building or back of sidewalk.

Practical Exception - a DelDOT process that assesses compliance efforts and approves alternative pedestrian system features for situations that cannot be constructed to achieve full compliance with the minimum accessibility standards established in this document.

Project Limits - the geographic limits of work associated with a project.

Project Scope - the type of work intended to be completed during a specific project.

Public Building or Facility - a building or facility, (or portion of a building or facility), that is: designed, constructed, or altered by, on behalf of, or for the use of a public entity subject to Title II of the ADA and 28 CFR Part 35 or to Title II of the ADA and 49 CFR 37 and 39.

Public Right-of-Way - public land or property, usually configured as interconnected corridors, that is acquired for or dedicated 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.

Qualified Historic Facility - a facility that is listed in or eligible for listing in the National Register of Historic Places, or designated as historic under an appropriate state or local law.

Running Slope - the grade (or slope) that is parallel to the direction of pedestrian travel.

Site - a parcel of land bounded by a property line or a designated portion of a public right-of-way.

Tactile - capable of being perceived using the sense of touch.

Vertical Surface Discontinuities - vertical differences in level between two adjacent surfaces, such as a step up or a step down along a sidewalk, or adjacent stepping stones of varying thickness with surfaces that are not aligned to be flush.

P.3 References And Source Materials

This document includes references to guidelines and design standards that have been researched, compiled, published, and maintained through the efforts of nationally recognized professional organizations and publications. Any direct references to or insertion of specific portions of such guidelines or standards may generally be considered as minimum criteria or standards within the authority of this document. Any general references to such guidelines or standards in their entirety may generally be considered as guidance materials, (to be considered during design and construction), within the context of this document. The Department may exercise engineering judgement in some cases and rely on standards and criteria, (for transportation elements, streets, and highways under its jurisdiction), that differ from the minimum criteria presented within this document or within the external guidelines and design standards referenced by this document.

This document is intended for use by qualified practitioners, and provides access to relevant standards and criteria (including various numerical design values and use conditions). The design, construction, and maintenance references contained in this document recognize many variable and often complex process considerations. The engineering design process, and associated use of this document, incorporates aspects of engineering judgment, design principles, science, and recognized standards towards matters involving transportation operations and roadway infrastructure. Department standards, criteria, and manuals should be taken into consideration when planning for the design, drafting and submission of projects that abut or have an impact on the local transportation system, state highway system or the national highway system. Users of this document are cautioned that the strict application of exact numerical values, conditions or use information taken from portions of the text may not be appropriate for all circumstances. Individual references to design values or concepts should not be used out of context or without supporting engineering judgment.

The design professional is encouraged to evaluate individual references respective of their context and placement within this document and should act upon them as either: basic design guidance (to the extent that some references within this document are general and suggestive in the execution of sound engineering judgement), or specific design criteria (to the extent that some references within this document are specific to a discrete design element or topic and prescriptive in the execution of sound engineering judgement).

P.3.1 References and Source Materials – National

The following guidelines, best practices, and design standards (which are made available in their entirety through nationally recognized professional organizations and publications) are incorporated by reference, except as modified within this document. In the event that conflicts may exist between incorporated references and the PAS, the *Pedestrian Accessibility Standards* controls.

AASHTO's "*Guide for the Development of Bicycle Facilities*", 4th Edition (2012)

AASHTO's "*A Policy on Geometric Design of Highways and Streets*",
6th Edition (2011), commonly referred to as "**the Green Book**"

AASHTO's "**Load and Resistance Factor Design Bridge Design Specifications (LRFD)**", 6th Edition (with 2013 Interim Revisions)

AASHTO's "**Roadside Design Guide**", 4th Edition (2011)

AASHTO's "**Manual for Assessing Safety Hardware (MASH)**", 1st Edition (2009)

Transportation Research Board (TRB)'s "**Highway Capacity Manual (HCM)**",
5th edition (2010)

US Access Board's "**Proposed Shared Use Path Supplement to: Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG)**",
(2011 with 2013 supplement incorporated)

P.3.2 References and Source Materials – State of Delaware

The following guidelines, design standards and/or independent manuals (which are made available in their entirety through their authoring Agencies and/or Departments of the State of Delaware) are incorporated by reference, except as modified within the PAS. In the event that conflicts may exist between incorporated references and the PAS, the *Pedestrian Accessibility Standards* controls.

DelDOT's "**Road Design Manual**" (2011 as amended through 2016)

DelDOT's "**Standard Construction Details**" (2014 as amended through 2016)

DelDOT's "**Standard Specifications for Road and Bridge Construction**"
(2001 as amended through 2016)

DelDOT's "**Bridge Design Manual**" (2015 as amended through 2016)

DelDOT's "**Traffic Design Manual**" (2015 as amended through 2016)

DelDOT's "**Traffic Calming Manual**" (2012 as amended through 2016)

P.3.3 References and Source Materials – Regulations

Regulations that are adopted through the Federal or State of Delaware Register of Regulations shall be taken into consideration in each aspect of planning, design or construction, where such Regulations may have independent jurisdiction over applicable elements, irrespective of any consideration in this document. The omission of explicit references to any such applicable State or Federal Regulation from this document shall not have the effect of sheltering the design professional from the separate and/or additional responsibilities that such Regulations may create. In the event that conflicts may exist between State or Federal Regulation and the PAS, the more restrictive criteria should be used, while meeting the intent of the controlling Regulation. All Regulations shall be considered in their entirety, inclusive of any amendments, in their most current version.

The following is not an exhaustive list, but includes some of the more commonly referenced Regulations:

Delaware Version: Federal Manual on Uniform Traffic Control Devices (DE-MUTCD)
(2011 as amended or current version)

U.S. DOT Federal Transit Administration (2006-DOT/ADA) American with Disabilities Act
(2006 - [49 CFR Part 37](#) as amended or current version)
Applies outside of ROW and applies to Transit features.

U.S. DOJ American with Disabilities Act (2010-DOJ/ADA) Standards for Accessible Design
(2010 - [28 CFR Part 35](#) and [Part 36](#) as amended or current version)
Applies outside of ROW and applies most commonly to site and accessory facilities.

Delaware Utilities Manual Regulations (2007 as amended or current version)

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1.0 Introduction

Highways, roadways, and streets provide for the movement of cars, trucks, transit vehicles, and bicycles, while sidewalks, crosswalks, shared use paths, and shoulders provide accessibility for pedestrians and/or bicyclists. The public transportation right-of-way (ROW) corridor serves a complex mix of transportation uses and functions while providing for a wide array of overhead/underground public utilities and drainage/stormwater facilities. Ownership or jurisdictional authority for the roadways and pedestrian facilities within the ROW may be shared across State, County, and Municipal agencies. Multi-party authority and responsibility can increase the layers of complexity during the planning, design, and construction phases. This complexity of overlapping jurisdiction and shared responsibility frequently continues into the maintenance programs and activities that are necessary along roadways and pedestrian facilities.

Persons with disabilities are sometimes faced with unique challenges in the ROW and may navigate the ROW and facilities with varying degrees of ease or difficulty. Some examples of common disabilities which must be accommodated involve mobility, vision, and hearing impairments. Persons with mobility impairments may rely on wheelchairs, scooters, walkers, or canes to traverse the pedestrian and roadway environments. Persons with sensory impairments may experience challenges related to interacting with, or perception of, their surroundings and transitional elements. In some cases, the challenges experienced may be the result of a combination of disabilities. This spectrum of interaction challenges and potential combinations of impairments leads to the need for a comprehensive and thoughtful approach to serving the wide range of persons with disabilities.

The responsibility to account for persons with disabilities touches on all aspects of planning, designing, constructing, and maintaining pedestrian facilities, elements, and features. This responsibility also creates a need to provide a balance among the competing factors when selecting the most appropriate accessibility improvement while accounting for the constraints of adjoining land development uses and existing conditions. Balancing these requirements must result in the selection of the most appropriate balanced design for all users.

1.1 Purpose and Need

The Pedestrian Accessibility Standards (PAS) provide consistent criteria for the design of Pedestrian Accessible Routes (PAR) elements. The standards and design criteria provided in this document support all public and private sector transportation planners and engineers in their effort to achieve a more consistent approach to planning, design, construction, and maintenance of accessible pedestrian facilities in the ROW.

In addition to Minimum Standards, this document also provides Desired Standards for a select group of PAR elements. These PAR Minimum Standards and selected Desired Standards meet or exceed applicable standards from the US Department of Transportation's 2006 *ADA Standards for Transportation Facilities* (US DOT 2006 ADA) and US Department of Justice's 2010 *ADA Standards for Accessible Design* (US DOJ 2010 ADA) for similar pedestrian features. The use of Desired and Minimum Standards is further explained in Chapter 3. Desired Standards are prioritized above Minimum Standards, and reductions below Desired standards will require documentation of the effort taken to achieve compliance and the challenges encountered. Such reductions will only be permitted when the Desired Standards cannot be fully met. Where a Minimum Standard cannot be

fully met, and no alternative to achieve full compliance is considered feasible, the pedestrian improvements must be designed to comply with the underlying goals of the Standards to the maximum extent practicable. A separate formal justification and approval process will be triggered; see Chapter 4 for more information on Requests for Practical Exception (RPE). For PAR elements or pedestrian features that were not addressed specifically in the US DOT 2006 ADA or US DOJ 2010 ADA, the US Access Board's draft *Public Right of Way Accessibility Guidelines* and subsequent Supplement (PROWAG 2011 and 2013) were reviewed and considered when DeIDOT established the proposed best practices and standards for selected features that are included in the PAS.

1.2 Applicability of Standards

The standards contained in this document are to be used to design, construct, and maintain pedestrian facilities within and along streets and highways under DeIDOT's jurisdiction. These standards do not cover recreational trails. For guidance on the design of accessible trails, the reader is referred to the Federal Highway Administration (FHWA) publication, "Designing Sidewalks and Trails for Access - Part II of II: Best Practices Design Guide", which can be found at www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalk2/sidewalks215.cfm.

1.3 Supporting Reference Materials and Sources

The DeIDOT PAS has been developed to meet the spirit and intent of the legislation and regulatory requirements of ADA, USDOJ and USDOT as well as various other guidance documents available as of the date of this publication. (See Preface P.3 for a list of references). The designer is encouraged to research accessibility topics on a per project basis, because updated versions of relevant reference and additional source materials are periodically provided on-line, such as: amendments to existing and proposed federal regulations, additional guidance documents, and many interim updates, that may provide additional or revised guidance to assist with constrained designs.

1.4 Engineering Judgment

When planning for the safety and accessibility of pedestrian facilities, planners and designers are advised to seek out the latest information and current best practices for elements not explicitly dealt with in the PAS. Some key design elements useful in establishing pedestrian safety and accessibility in the ROW, such as wayfinding and smoothness, are still being researched and practical guidance is still being developed to help better address these elements. Guidance information should be weighed to ensure it is directly applicable to the actual circumstances being addressed. Where applicable, such guidance must be implemented using sound engineering judgment, to address the conditions and constraints found within the project scope, and to provide accessible pedestrian facilities that offer concurrent benefits for all users.

Designers must exercise engineering judgment in the application of pedestrian design concepts and must include the evaluation of pertinent information available at the time of the design. Engineering judgment must account for the implementation of appropriate principles, standards, guidance, and current best practices related to the applicability, design, operation, and/or installation of public improvements.

2.0 Project Type and Application of Standards

2.1 Project Scope, Intent, and Impacts

The Project Type provides the framework for applying the Pedestrian Accessibility Standards (PAS) to the design and built environments. The determination of Project Type is relative to the primary intent of the project design, nature of the construction activity and net impact on the pedestrian network. The project's scope and limits cannot be intentionally meandered to avoid or skip over pedestrian facilities that are within the logical limits of proposed roadway work. Project activities and construction sequencing must not result in an unmitigated negative impact to existing pedestrian accessibility. A negative impact created by an alteration or treatment that decreases or has the effect of decreasing the existing accessibility of a pedestrian facility or feature (below the established requirements that are in place at the time of the alteration or treatment) will not meet the Standards established by DeIDOT.

2.2 Project Types

Projects are classified into one of the following Project Types:

2.2.1 New Construction Projects

New Construction projects are roadways or pedestrian facilities that are built on new alignment.

New Construction projects shall meet the PAS Desired Standards (see Chapter 3) except where safety concerns, operational needs or other constraints limit the ability to achieve full compliance.

Physical constraints resulting in justifiable use of Minimum Standards on New Construction Projects are limited to only those rare situations when the unique characteristics of terrain, existing conditions or constrained ability to acquire additional ROW make it impracticable to construct facilities that meet the Desired Standards. If full compliance with the Desired Standards is deemed impracticable, compliance is required to the maximum extent practicable, and documentation of the constraint affecting compliance must be provided.

In rare situations, the need to avoid impacts to structures, environmental or cultural resources may preclude compliance with Minimum Standards. In those unique cases, a Request for Practical Exception will be needed in accordance with the procedures and approvals described in Chapter 4.

2.2.2 Reconstruction Projects

Reconstruction projects are roadways or pedestrian facilities that are rebuilt primarily along existing alignment. Work that would fall into the category of reconstruction includes bridge superstructure replacement, full depth pavement replacement, adding through lanes adjacent to an existing alignment, changing the fundamental character of the roadway (e.g., converting a two-lane highway to a multi-lane divided arterial), changing vertical or horizontal alignment, or reconfiguring intersections and interchanges.

Reconstruction projects, by definition, occur within the built environment and, as such, may encounter constraints not present in New Construction projects. While some, such as reconfiguring a grade separated interchange, may involve substantial right-of way acquisition, others, such as bridge superstructure and full depth pavement replacement, may be much more limited in scope in this regard. As such, the ability to meet Desired Standards may vary depending upon the scope of the project. For more extensive projects, and those involving more than minor ROW acquisition, the design should comply with the Desired Standards. For more limited Reconstruction projects, where Desired Standards cannot be met within the scope of the project, compliance with the Minimum Standards is acceptable, providing the reason for not achieving the Desired Standard is documented. In circumstances where Minimum Standards cannot be met, a Request for Practical Exception (RPE) shall be required (see Chapter 4).

2.2.3 Resurfacing, Restoration, and Rehabilitation (3R) Projects

3R Projects are work undertaken to extend the service life of an existing highway and enhance highway safety. This includes placement of additional surface material and/or other work necessary to return an existing roadway, including shoulders, bridges, the roadside, and appurtenances to a condition of structural or functional adequacy. Examples of this type of work include:

- Addition of a new layer of pavement, with or without milling.
- In-place recycling
- Microsurfacing or thin lift overlay
- Open-graded surface course
- Roadside safety improvements
- Signing, pavement marking, and traffic signals
- Turn lanes.
- Widening lanes and/or shoulders
- Railroad crossing upgrades.
- Modification of a crosswalk, including striping of a new crosswalk
- Bridge rehabilitation
- Systemic repair of a sidewalk network or corridor

When a 3R project alters existing pedestrian facilities, affects the pedestrian usability of the existing Pedestrian Circulation Path (See Section 2.2.3.1 below), or abuts known deficiencies such as barriers (including missing or inadequate curb ramps) that prevent access to pedestrian facilities, the affected facilities shall meet the PAS standards and design criteria to the maximum extent practicable except where safety concerns, operational needs or other constraints limit the ability to achieve full compliance. For example, a resurfacing project is considered to be an alteration to any PAR which crosses the resurfaced roadway. In that case, the pedestrian crossing, including curb ramps, must comply with the PAS.

New pedestrian features created within 3R Projects shall be made accessible to persons with disabilities. Existing pedestrian circulation paths that are altered within the scope of 3R Projects shall be made accessible for persons with disabilities to the maximum extent practicable within the project scope. Projects limits and project activities must be evaluated to

determine if impacts are expected to affect accessibility or would pass by known access barriers where curb ramps are needed. 3R Projects are not required to undertake any additional work beyond the improvement/restoration of altered facilities and/or correction of known access barriers where curb ramps are missing or inadequate.

Due to the limited scope of 3R projects and the fact that they occur in the built environment, it may be impractical to design all pedestrian features to the Desired standards. In those cases, the features shall be designed to meet or exceed the Minimum Standards, and the reason for not meeting Desired standards must be documented.

In limited circumstances, constraints in the built environment may prohibit the designer from meeting the Minimum standards in a specific location. In that case, the feature should be designed to meet the Minimum standards to the maximum extent practicable and a Request for Practical Exception (RPE) shall be required, (see Chapter 4). The design process and plan approval shall be contingent on receipt of RPE approval or successful implementation of a PAS compliant design.

2.2.3.1 Impacts to Pedestrian Usability

Impacts to pedestrian usability include changes to a pedestrian feature that alter the way in which users interact with that feature, such as:

- A. Changes in the geometrics or alignment of a pedestrian crossing
- B. Modification or creation of pedestrian refuge areas that are part of a pedestrian crossing
- C. Relocation or replacement of existing crosswalk striping
- D. Creation of new pedestrian crossing locations, including installation of crosswalk striping where none previously existed
- E. Modification of existing or installation of new Pedestrian signage or Pedestrian traffic signal elements
- F. Changes to the surface drainage of paved surfaces that alter the potential for ponding of water in or adjacent to pedestrian features such as low spots affecting Curb ramps
- G. Patching of paved surfaces within a pedestrian street crossing.

2.2.4 Maintenance Projects

Maintenance Projects are work directed towards maintaining the existing roadway and related appurtenances as necessary for safe and efficient operation. Design improvements are not within the scope of maintenance projects. Examples include:

- Chip seals
- Crack filling and sealing
- Diamond grinding
- Dowel bar retrofit
- Fog seals
- Joint crack seals
- Pavement and bridge joint repairs
- Pavement patching

- Scrub sealing
- Slurry seals
- Spot application of high-friction treatments
- Surface sealing projects
- Signing
- Striping (or painting) lanes
- Minor traffic signal upgrades
- Repairs to drainage systems
- Guardrail work
- Bridge deck patching
- Minor or spot sidewalk repairs

Pedestrian accessibility upgrades are not required on Maintenance Projects. These projects, however, are not permitted to alter or reduce access to pedestrian facilities or the Pedestrian Circulation Path.

Note: The combination of two or more maintenance activities occurring at or near the same time may elevate the combined maintenance activity to a 3R activity, and would therefore be required to comply with the provisions of Section 2.2.3.

2.2.5 Temporary Pedestrian Access during Construction and Maintenance

The development of contract documents for projects that directly or indirectly impact pedestrian facilities or prevent access to those facilities, (including the development of scheduled maintenance projects that may impact pedestrian facilities), must address both Maintenance of Traffic (MOT) for vehicles as well as maintenance of pedestrian access as detailed in Chapter 6 of the DE MUTCD. The focus of MOT planning is to ensure that all pedestrians, including persons with disabilities, and all vehicular traffic can safely navigate the project site throughout all phases of scheduled maintenance and construction activities. See DE MUTCD, Part 6, Typical Applications 28 and 29 for guidance. MOT planning shall be coordinated with DelDOT Traffic section.

3.0 Accessibility Design Standards

3.1 Use of Accessibility Design Standards

The following accessibility design standards shall be used to design, construct, alter and maintain the Pedestrian Access Route (PAR) features along the highways, streets and roadways covered by these standards. On projects that create, modify, or impact pedestrian features or facilities, reasonable effort shall be made to meet these standards to the maximum extent practicable. Existing physical constraints that may complicate the designer’s ability to meet the standards provided in this document include, but are not limited to, features such as: underlying terrain, right-of-way availability, underground structures, adjacent developed facilities, drainage components, or the presence of notable natural or historic features. Where design constraints or existing physical constraints limit the ability to create or modify PAR elements, spaces, or facilities to achieve full compliance, designers should document the effort to optimize compliance.

Impacted features shall be designed to meet the Desired Standards to the maximum extent practicable. When it is not practicable for a New Construction project to design or construct a pedestrian feature to the Desired Standards, but a pedestrian feature can be designed and constructed to meet or exceed the Minimum Standards, the designer should document the reason that the applicable Desired Standards cannot be met. Designers should not reduce features directly to a Minimum Standard without a documented constraint or written justification supporting the use of that Minimum Standard of accessibility. Any documentation related to areas of minimized accessibility shall be retained by the Designer as part of the project file.

Table 3.1 identifies PAR features with established Desired Standards and/or Minimum Standards.

Table 3.1 Common Examples of Desired and Minimum Standards

The use of values between the Desired and Minimum Standards is preferred where constraints make compliance with Desired impracticable	DeIDOT Desired Standard	PAR Minimum Standard
Pedestrian Connections (Includes Blended Transitions and/or Curb Ramps)		
Width - for all pedestrian (ped.) connections (excluding flares, curbs, and walls)	60" min.	48" min.
Turning space - for curb ramps (matching width of approach PAR and with no constraints)	60" x 60" min.	48" x 48" min.
Turning space - for curb ramps (matching width of approach PAR but with constraints)	N/A	60" min. in direction of ped. crossing
Clear space - for all ped. connections with turning movements in the gutter or street area (must be located beyond bottom grade break, outside of parallel vehicle path, can include drop curb)	60" x 60" min.	48" x 48" min.
Drainage grate placement - for all ped. connections (New Construction & Reconstruction)	N/A	Out of PAR and Ramp

Pedestrian Accessibility Standards for Facilities in the Public Right-of-Way

The use of values between the Desired and Minimum Standards is preferred where constraints make compliance with Desired impracticable	DelDOT Desired Standard	PAR Minimum Standard
Pedestrian Connections (continued)		
Drainage grate placement (3R and Maintenance Projects)	Out of PAR and Ramp	N/A
Counter Slope (absolute algebraic difference for New Construction & Reconstruction) *without a 2 ft transition landing	11.0%	*13.3%
Counter Slope (absolute algebraic difference for 3R Projects reconstructing curb & gutter) *without a 2 ft transition landing	11.0%	*13.3%
Sidewalk		
Clear width of Pedestrian Access Route or PAR (excluding curb)	60" min.	48" min.
Passing Area Size (for new/modified PAR <5 ft wide)	N/A	60" x 60" min.
Passing Area Spacing (for new/modified PAR <5 ft wide)	N/A	200 feet max.
Buffer Area width (grass between back of curb and sidewalk)	36" min.	24" min.
Buffer Area width (including trees between curb and sidewalk)	N/A	72" min.
Vertical Clearance (bottom of regulatory, warning, or guide signs)	N/A	84" min.
Vertical Clearance (to bottom of general overhead obstructions)	N/A	80" min.
Protruding Objects (above 27" and below 80") on fixed structures	N/A	4" max.
Protruding Regulatory, Warning, or Guide Signage (above 27" & below 84") on posts	0" max.	4" max.
Protruding Non-Regulatory Signage (above 27" & below 80") on posts	N/A	4" max.
Protruding Objects (above 27" and below 80") measured from post, barricade, detectable indicator, or base)	N/A	4" max.
Maneuvering Area at offset obstructions (New Construction and Reconstruction)	N/A	60" x 60" min.
Maneuvering Area at offset obstructions (3R and Maintenance Projects)	N/A	48" x 48" min.
Pinch Points at existing obstructions (Alteration, 3R, and Maintenance Projects)	N/A	34" min. width x 24" max. length

The use of values between the Desired and Minimum Standards is preferred where constraints make compliance with Desired impracticable	DeIDOT Desired Standards	PAR Minimum Standards
Shared Use Path (SUP)		
Clear width of SUP	120" min.	96" min.
Vertical Clearance (to bottom of overhead obstructions and signs)	N/A	96" min.
Vertical Clearance (to bottom of overhanging vegetation & limbs)	120" min.	96" min.
Protruding Objects (below 96")	N/A	0" max.
Median and Channelized Island Crosswalk		
PAR width through medians and islands (excluding expansion joints and material)	Match width of approach PAR	60" min.

For features with no identified Desired Standard, the designer shall determine if the feature can be designed and constructed to meet the Minimum Standards, (no documentation would be required unless the Minimum Standard cannot be met). If it is identified that a pedestrian system feature cannot be designed or constructed to the PAR Minimum Standards, then the designer or inspector that identifies the issue shall escalate the non-compliant issue to the attention of DeIDOT Section that has been assigned design or approval authority for the affected project. The designer or inspector must coordinate the submittal of a formal request for Practical Exception (RPE) in accordance with the process outlined in Chapter 4. The RPE process should be set in motion and involve DeIDOT at the earliest point the deficiency is identified.

Where conflicts arise between necessary roadway (or traffic control) elements and required PAR elements, the designer shall optimize compliance with the pedestrian accessibility standards, balancing the needs and safety of both roadway traffic and PAR users.

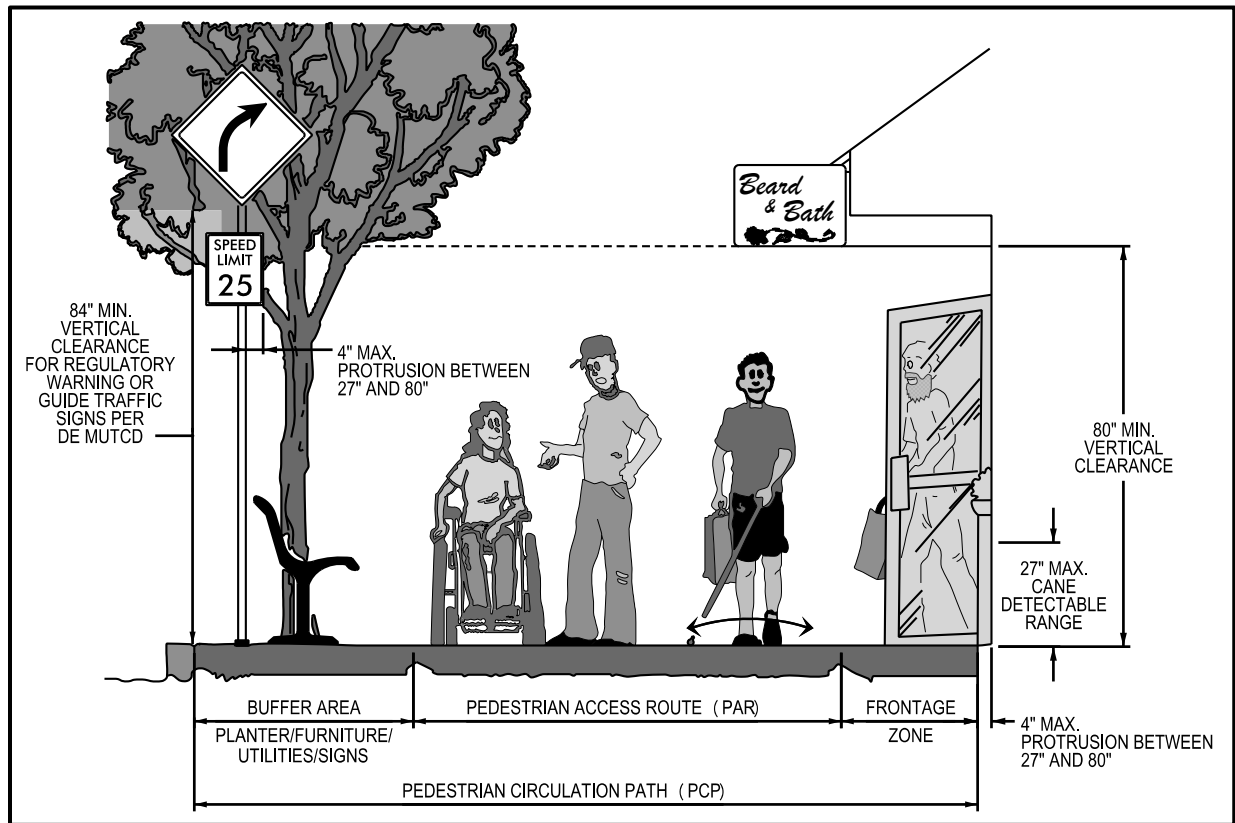
All dimensions are subject to conventional manufacturing and industry tolerances except where the requirement is stated as a range with specific minimum and maximum end points.

3.2 Pedestrian Facility Components

A Pedestrian Access Route (PAR) is a continuous and unobstructed path of travel, provided for pedestrians with disabilities, located within or coinciding with a Pedestrian Circulation Path (PCP). A PAR must be provided within sidewalks and other pedestrian facilities located in the Public Transportation Right-of-Way (ROW). The PAR connects accessible elements, spaces, and facilities which are located in the ROW. The PAR should be placed to minimize the distance which persons with mobility impairments and other persons with disabilities must travel compared to the general public. These affected components include many elements and features such as: accessible pedestrian signals and pedestrian push buttons, street furniture, boarding and alighting areas and boarding platforms at transit stops, transit shelters, accessible on-street parking spaces, parking meters and parking pay stations serving accessible parking spaces, and accessible passenger loading zones. A PAR is not required if a PCP is not provided, but New and Reconstruction Projects (and corridor re-alignment projects) are expected to consider pedestrian

usage and/or need. Designers must identify nearby public use facilities, (which are common pedestrian destinations), such as: government buildings, schools, churches, community centers, hospitals, transit stops, commercial and residential areas. Pedestrian access to these various destinations should be considered holistically, including elements within the public ROW as well as connections or linkages that are outside of the public ROW, accounting for and where possible complimenting the full range of existing PAR and PCP in the area.

Figure 3.2 PAR / Pedestrian Facility Elements / ADA Compliance Considerations



As illustrated in Figure 3.2, the general PCP may contain three areas that vary in width based on the proximity of the adjacent land development uses.

3.2.1 Pedestrian Facility Buffer

This recommended buffer area is located directly behind the curb and typically is used to locate regulatory and other signs, street lights, fire hydrants, overhead and underground utilities and street furniture where permitted. Of equal importance, is that the buffer provides pedestrians with a separation from moving traffic and a greater level of comfort. This area typically has a contrasting surface such as grass, landscaping or is paved in a contrasting material, color, or pattern to distinguish it from the PAR.

3.2.2 Pedestrian-Access Route (PAR)

This portion of the PCP provides pedestrians with a safe, convenient, continuous, and unobstructed pedestrian route in the ROW that connects all accessible elements of a pedestrian

system. Accessible routes shall coincide with, or be located in, the same area as general pedestrian circulation paths.

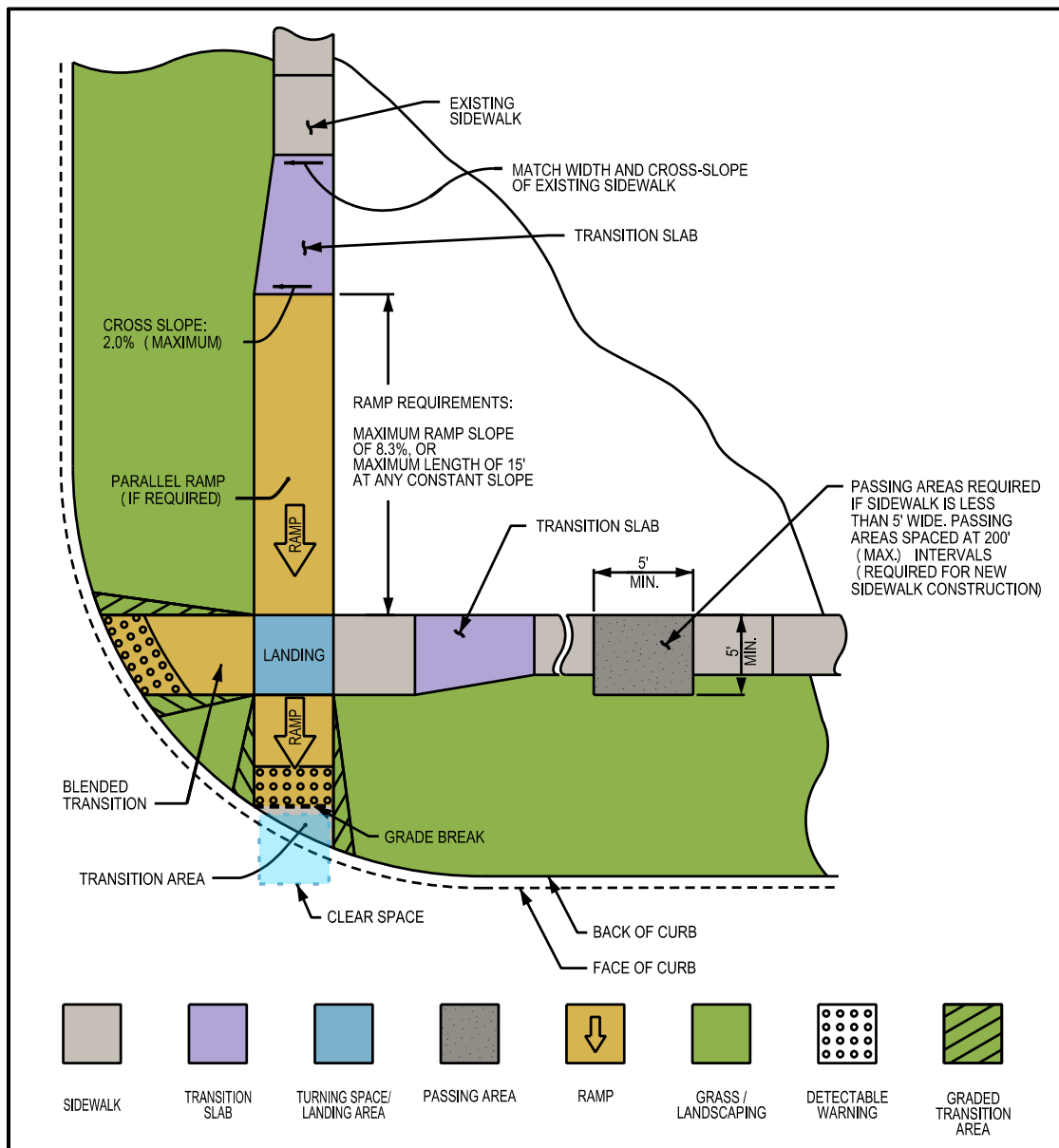
3.2.3 Pedestrian Frontage Zone

This is the linear portion of the pedestrian corridor that is functionally necessary to allow pedestrian maneuvers and connections when the sidewalk is adjacent to buildings or the properties that have frontage along the ROW line.

3.3 General

As illustrated in Figure 3.3, the general PCP at intersections where sidewalks meet or cross roadways or streets may contain a variety of elements that influence the placement and design of the sidewalk and street crossings. These should be considered during the design, operation, alteration, and maintenance of accessible pedestrian facilities.

Figure 3.3 Schematic of Typical Sidewalk and Pedestrian Connection Elements



General pedestrian accessible route features and requirements are outlined below:

3.3.1 PAR Surface

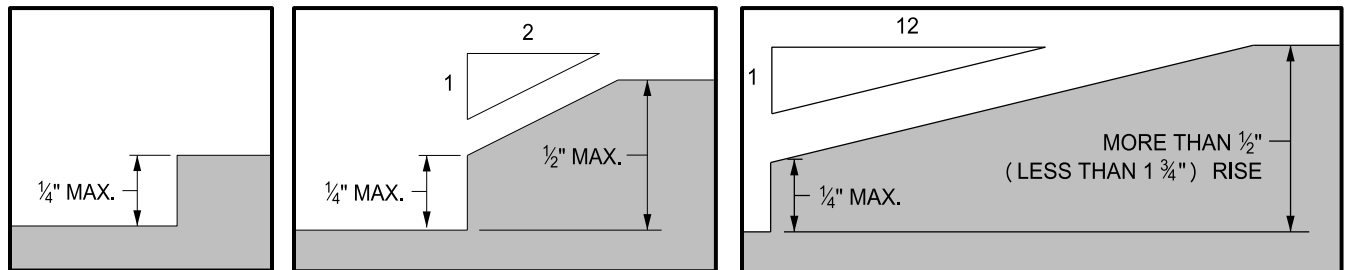
The PAR portion of the pedestrian facility shall be planar, smooth, and continuous and shall be constructed of a uniform material that is firm, stable, and slip resistant. Typical materials are:

- A. Concrete (Portland Cement Concrete)
- B. Bituminous Concrete
- C. Brick Pavers
- D. Concrete Pavers
- E. Other Materials (Requires pre-approval by DelDOT)

3.3.2 PAR Vertical Surface Discontinuities

Vertical surface discontinuities between adjacent surfaces shall be beveled where greater than $\frac{1}{4}$ inch. Vertical surface discontinuities between $\frac{1}{4}$ inch and $\frac{1}{2}$ inch shall be beveled with a slope not steeper than 2H:1V (50.0%) as illustrated in Figure 3.3.2. Where a vertical difference of $\frac{1}{2}$ inch or less is impracticable, the surface discontinuity shall be sloped no steeper than 12H:1V (8.3%). The transition between the depressed curb at a blended transition or ramp segment and gutter must meet the requirements of Section 3.8.7.8. Beveling shall be applied across the entire limits of the vertical surface discontinuity.

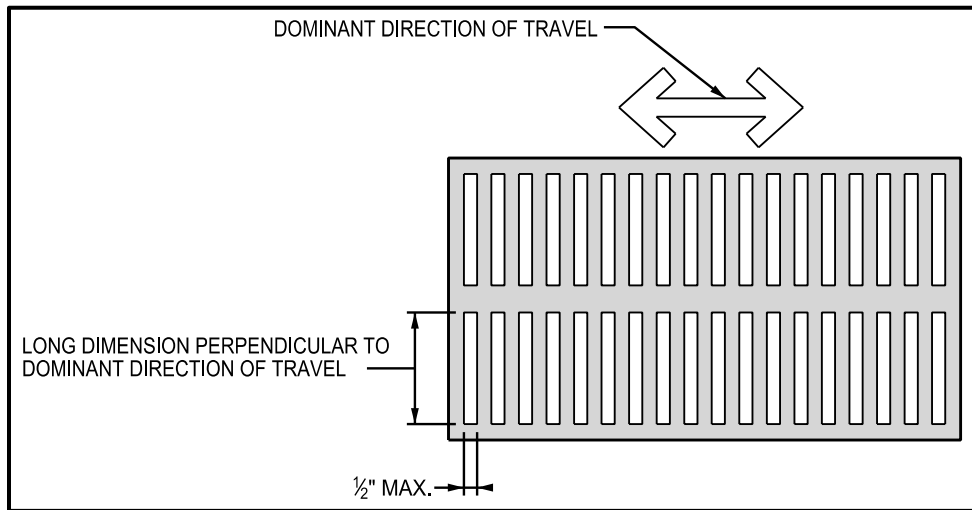
Figure 3.3.2 PAR Vertical Elevation Differences



3.3.3 PAR Horizontal Gaps and Joints

Horizontal gaps and sidewalk joints in the PAR shall not exceed $\frac{1}{2}$ inch in width and depth. Spaces wider than $\frac{1}{2}$ inch can pose a catch point for users of a wheelchair, walker or crutches and cause the user to be ejected, turn over, trip or fall. Elongated openings, like those found in grates intended to be used in the PAR, shall be oriented so that the long dimension is perpendicular to the dominant travel direction as shown in Figure 3.3.3. In locations where there is no dominant travel direction, openings must be limited to $\frac{1}{2}$ inch maximum dimension in any travel direction. Where an accessible route is available to bypass openings completely, they can be oriented in any direction. In PAR portions of the roadway where existing inlets or grates are not being relocated, an accessibility compliant grate meeting the opening limitations of this section shall be selected, from DelDOT's Standard Construction Detail D-5, and installed.

Figure 3.3.3 Elongated Openings in Floor or Ground Surfaces



3.4 Sidewalks and Shared Use Paths

Sidewalks and other elements shall be designed using the criteria provided below:

3.4.1 Sidewalk Width

- A. **Desired Standard** - 5 feet minimum, excluding the top of curb width.
- B. **Minimum Standard** - 4 feet minimum, excluding the top of curb width.

3.4.2 Shared Use Path (SUP)

- A. **Desired Standard** - 10' wide minimum, with the full width accessible to pedestrians.
- B. **Minimum Standard** - 8' wide minimum, with the full width accessible to pedestrians.
- C. **Bicycle Interactions** - Additional consideration shall be given to user interactions with bicycles during the design and/or construction of shared use paths, refer to additional guidance such as the AASHTO *Guide for the Development of Bicycle Facilities*.

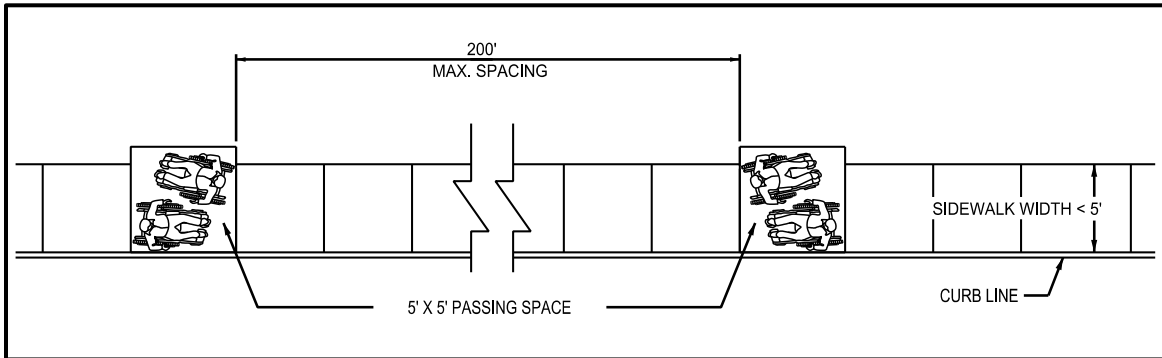
3.4.3 Sidewalks and Shared Use Paths on Structures

Sidewalk and SUP width on bridges and structures should at least match the existing PAR that aligns with the bridge or structure, to allow for uninterrupted pedestrian flow. If the bridge is 200 feet or greater in length, the sidewalk width shall be at least 5 feet in width. If pedestrian facilities cannot be provided on both sides of the bridge, safe roadway crossings must be provided on both ends of the bridge or at nearby intersections, along with appropriate signing. When a sidewalk or SUP is only provided on one side, consideration should be given to providing a wider path to accommodate larger volumes of pedestrians. If curb and sidewalk are monolithic on a bridge, then the sidewalk width shall be increased to include the curb zone in addition to the required sidewalk width. Sidewalks on structures must comply with the requirements for placement of ramps, where applicable on each PAR approach. Refer to the DelDOT Bridge Design Manual for additional guidance and requirements for pedestrian safety railings, vehicular barrier placement, and related selection criteria.

3.4.4 Sidewalk Pedestrian Passing Areas

If a new or modified PAR width of less than 5 feet is proposed along a roadway, passing areas must be provided. Minimum Standards for passing areas include minimum dimensions of 5 feet wide by 5 feet long with a 50H:1V (2.0%) cross slope. Passing areas shall be provided at intervals not to exceed 200 feet. Driveways and intersecting walkways serving residences or businesses may be used as passing areas, provided that these facilities meet the length, width, and cross slope requirements. See Figure 3.4.4 for an example of passing area layout.

Figure 3.4.4 Passing Area Layout



3.4.5 Sidewalk and Shared Use Path Running Slope

Where sections of the PAR are contained within the ROW but not within pedestrian street crossings, the running slope of the PAR in the primary direction of travel shall not exceed the general roadway profile slope of the adjacent street or highway or 5.0%, whichever is greater. Where sections of the PAR are not contained within a street or highway ROW, the running slope of the PAR in the primary direction of travel shall not exceed 20H:1V (5.0%), (except within areas designed as ramps or curb ramp locations per Section 3.8.2).

3.4.6 Sidewalk and Shared Use Path Cross Slope

Where sections of the PAR are contained within the ROW (but not within pedestrian street crossings, blended transitions, curb ramps, turning spaces, or landings) the slope of the PAR, perpendicular to the direction of travel, shall be a maximum 50H:1V (2.0%) cross slope, including crossings of residential driveways. Refer to Commercial Entrance Crossings (Section 3.6.2) for standards related to PAR cross slopes within commercial entrances. Refer to Pedestrian Connections (Section 3.8.7.2) for standards related to PAR cross slopes within pedestrian street level connections. Refer to Pedestrian Street Crossings (Section 3.10.2) for standards related to PAR cross slopes within pedestrian crosswalks at street level crossings.

3.4.7 Transition Slabs Connecting to Existing PAR

Transition slabs function as a transitional element that extends the existing sidewalk or SUP to meet the compliant PAR and allow for variations in width and/or cross slope to be blended across a brief distance. Transition slabs are appropriate at the localized limits of a pedestrian improvement and where a proposed pedestrian element is connecting to existing facilities which are not being altered and do not meet current standards. Transition slabs are not appropriate (and are not eligible for an RPE) if proposed for use between required features that are being constructed within the localized limits of an isolated pedestrian improvement or

proposed facility. Transition slabs are required to connect sidewalks to turning spaces/ landing areas with cross slopes that exceed 2.0% when connecting to pedestrian street level connections (see Section 3.8.7.2.C). The running slope of a transition slab should be 5.0% or flatter unless matching the parallel roadway or existing sidewalk running slope. The required length of PAR transition slabs connecting a new section of PAR to an existing PAR should be at least 5 feet in length for changes in width or cross slope. For cross slope transitions, the recommended transition rate is 1.0% per foot (not to exceed 3.0% per foot for 3R Projects) to address the absolute algebraic grade difference between the cross slopes of the PAR surfaces. For example, if the existing PAR cross slope is 8.0% away from the street, then the transition length must be at least 10 feet to change to a cross slope of 2.0% toward the street at the connection to the new PAR.

3.4.8 Compound Cross Slopes

Compound cross slopes are not acceptable within a PAR, including those formed by using abruptly non-planar surfaces. Cross slopes shall be designed to facilitate the use of mobility aids and ensure that multiple wheels or contact surfaces will remain supported when traversing grade breaks and gradual changes in cross slope. Cross slopes shall not include measurably crowned segments (including grade breaks that are parallel or diagonal to the direction of travel) within in the PAR. Variations in PAR cross slope that exceed 2.0% should be accomplished using sidewalk segments, SUP segments, or transition slabs with graduated changes from starting cross slope to final cross slope.

3.4.9 Utility Covers in the PAR

Utility covers and property access covers, (including basement access-ways that are located flush with the sidewalk in urban settings), located in the PAR pose compliance challenges. Where practical, designers shall first pursue relocation of the PAR or utilities to avoid the challenges created for users. New sidewalk alignments should be designed to avoid crossing existing utility covers and property access covers where possible. DeIDOT's Utility Manual provides additional guidance that may be useful in evaluating appropriate options. Utility covers in a PAR shall at a minimum be skid resistant and should comply with vertical surface discontinuity criteria (per Section 3.3.2) and horizontal gap and joint criteria (per Section 3.3.3) where such utility covers can be readily obtained.

3.4.10 Buffer Area

Reconstructed sidewalks that are routed parallel with the roadway shall be separated from the back of curb by a buffer area, where sufficient ROW is available, or can readily be obtained (if ROW acquisition is within the scope of the project). The buffer area shall be designed to be continuous along the sidewalk except at curb ramps and at obstructions, (including where the PAR has been shifted into the buffer area to maintain Desired PAR width). The Minimum Standard for buffer area width is 2 feet minimum without trees and 6 feet minimum with trees. The Desired Standard for buffer width is 3 feet between the edge of sidewalk and adjacent back of curb, edge of shoulder, or travel way. Buffers where trees are included must be wider to allow for irrigation, where provided, and separation distance to account for the required lateral offset or clear zone depending on the species of trees being proposed. The types of trees used must be pre-approved by DeIDOT Roadside Management.

3.5 Crosswalks and Unmarked Crossings

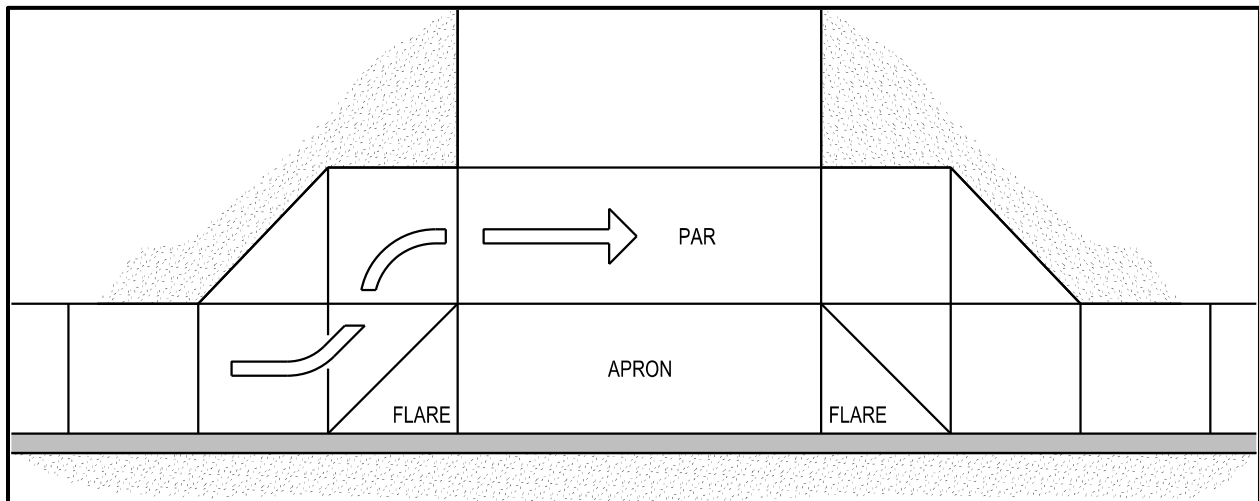
The presence of sidewalk connections at an intersection with a roadway implies that a crosswalk exists, whether it is marked or not (refer to DE MUTCD and Delaware Code, Title 21, Section 4143 for additional explanation). Unless pedestrian crossing is prohibited, accessible curb ramps must be provided at each impacted street level pedestrian crossing within a project's limits (See Chapter 2 for project types and related impacts) and at any newly created pedestrian crossings. If safety or operational reasons result in the need to prohibit pedestrian crossings at one or more legs of an intersection, the project designer or inspector shall request that DelDOT Traffic review the non-accessible location. When a potential crossing location is not made accessible and deemed unsafe by DelDOT Traffic, the sidewalk shall be marked with detectable indicators (see Section 3.7.5) and, where possible, physically separated from that intersection leg by providing a buffer area with grass, a landscaped planting strip or some other physical barrier between the sidewalk and curb. Advisory signage that warns PAR users of a non-accessible leg at an intersection or that directs pedestrians toward an accessible crosswalk must comply with the DE MUTCD.

3.6 Driveway and Entrance Crossings

3.6.1 Residential Driveway Crossings

Where a sidewalk crosses a residential driveway, PAR Minimum Standards must be applied to the design of the PAR portions of the driveway and sidewalk. Where PAR Minimum Standards such as a width of 4 feet or a 2.0% cross slope cannot be provided, an RPE will need to be submitted and approved using the RPE process outlined in Section 3.1. The location of the PAR may need to be varied across a driveway or entrance to account for adjoining slopes or to limit property impacts. See Figure 3.6.1 for a residential driveway example. This alternative routing places the PAR behind the driveway apron, which may require either an easement or additional ROW.

Figure 3.6.1 PAR Alternative for Crossing a Residential Driveway



3.6.2 Commercial Entrance Crossings

Where a PAR crosses a commercial entrance, the cross slope standards are as follows:

- A.** For New Construction projects, including projects for construction of new sidewalks, the Minimum Standard for cross slope shall be 50H:1V (2.0%) or flatter.
- B.** For 3R projects the Desired Standard for cross slope shall be 50H:1V (2.0%) and the Minimum Standard shall be 20H:1V (5.0%) or flatter.

For instances where it is impracticable under the scope of the project to achieve these Minimum Standard cross slopes, an RPE must be submitted.

In all cases, driveway or entrance operational characteristics for opposing slopes and elevation changes need to be evaluated for vehicular traffic, in addition to compliance requirements for pedestrian accessibility, to ensure that safe operating conditions are provided for all modes of transportation.

3.7 Obstructions and Protruding Objects

The placement of utilities, regulatory and other signs as well as tree branches, shrubs and vegetation can impact a coherent and continuous PAR corridor, especially when dealing with existing features in the built environment. In many circumstances, the designer is challenged with finding locations outside of the PAR for utility poles, signal poles, traffic equipment cabinets, mailboxes, street furniture and required street signs. In addition to analyzing design alternatives to deal with these objects, acquiring additional ROW may be necessary. Physical objects such as utility poles, mailboxes, signal poles, signal cabinets, signs, trees, and shrubs, that are not relocated or redesigned and protrude into or obstruct the PAR reduce the effective width of the PAR and create challenges for persons with disabilities, especially persons with visual impairments. Planning, design, construction, and maintenance of compliant pedestrian systems must meet the identified PAR Minimum Standards for these features. The placement of objects in the PCP and PAR must consider the following:

3.7.1 Placement and Grouping of Obstructions

New aboveground utilities are to be located behind the sidewalk, where ROW and/or easements are available. If space behind the sidewalk is not available, utilities may be located within the buffer area between the back of the curb and sidewalk. Lateral offset must be accounted for in an urban or restricted environment, (including along roadway tangents and the insides of roadway curves) when re-locating obstructions. Lateral offset (LO) must be evaluated and should be established to ensure that the required minimum operational clearance between the face of curb and adjacent roadside objects has been provided. Additional guidance on applying the lateral offset is available in the AASHTO Roadside Design Guide and the DelDOT Road Design Manual (RDM). If signs, poles, or other obstacles must be located in the sidewalk, design priority is given to placing these either right or left of center to provide a consistent utility and sign corridor. Placement of regulatory and traffic signs and sign poles behind the sidewalk to create a clear width PAR corridor will require coordination to ensure DE MUTCD compliance is maintained. In addition to a grass strip, special sidewalk treatments such as brick pavers or stamped concrete are permitted to be used to provide a different surface

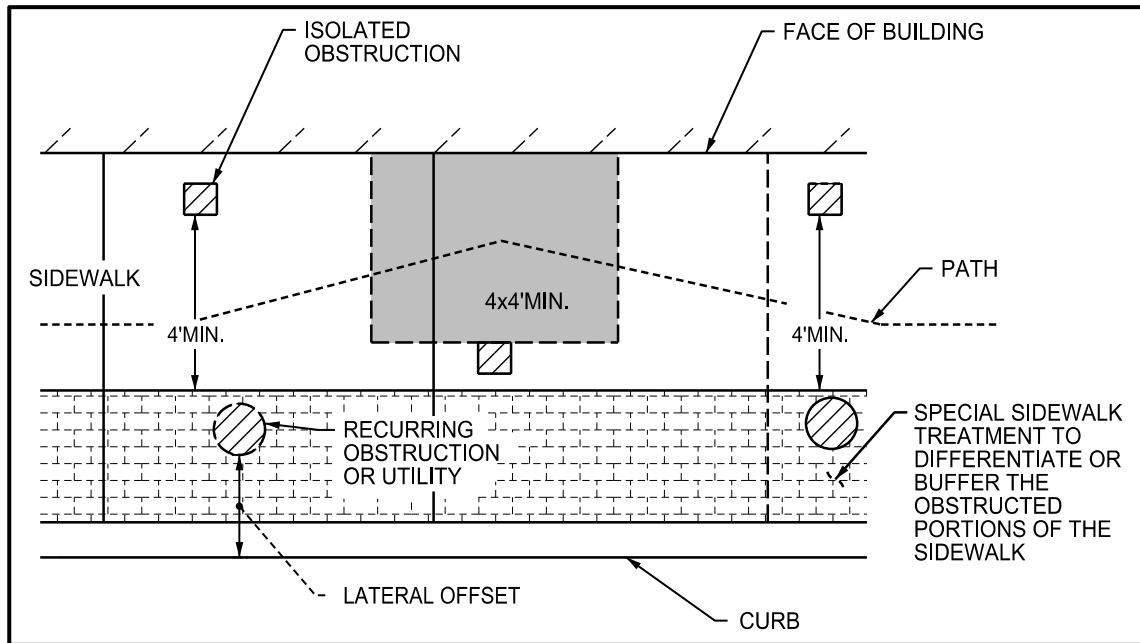
texture and/or color to differentiate or buffer the obstructed portions of the sidewalk from the clear width PAR corridor. See Figure 3.7.1.1.

3.7.1.1 Multiple Obstructions and Pivot Points

Designers are expected to avoid the offset grouping of obstructions in the PAR. In instances where multiple obstructions are located in or adjacent to the PAR due to physical constraints, and where an obstruction in the PCP cannot be removed, the following PAR Minimum Standards for Pivot Points apply:

- A.** New and Reconstruction Projects - PAR layout at grouped obstructions and pivot points shall include a 5 feet x 5 feet accessible maneuvering area.
- B.** 3R and Maintenance Projects - PAR layout at grouped obstructions and pivot points shall include a 4 feet x 4 feet accessible maneuvering area (See Figure 3.7.1.1).

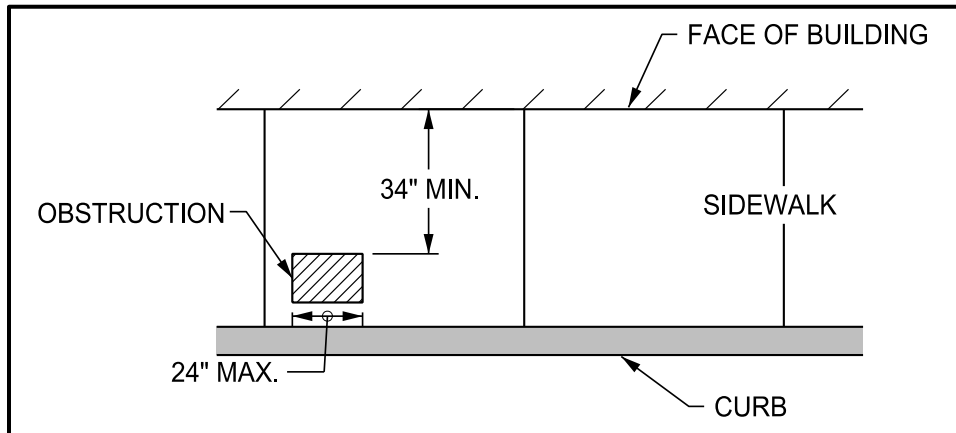
Figure 3.7.1.1 Grouped Obstructions and Pivot Point Clearance on 3R - Projects



3.7.1.2 Pinch Points

The Minimum Standard for PAR pinch points includes not be less than 34" in width and not more than 24" in length, measured in the direction of travel, as illustrated in Figure 3.7.1.2. Pinch Points are permitted only in constrained areas of Maintenance, 3R, and Alteration Projects. Pinch points are not permitted on New Construction Projects.

Figure 3.7.1.2 Pinch Point Clearance



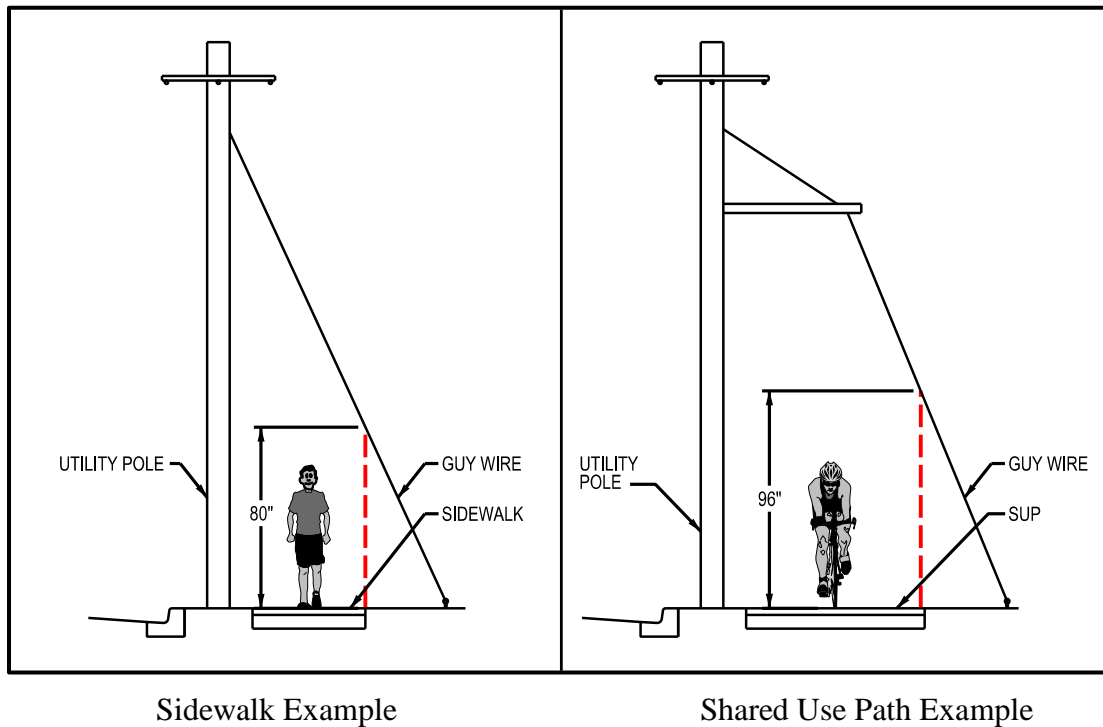
3.7.2 Cane Detectable Range

Locate necessary objects with detectable elements or indicators provided between the PAR surface level and a height of 27 inches, known as the cane detectable range, to avoid catch points that the visually impaired user will not be able to detect. The effective width of the PAR cannot include detectable obstructions, which would reduce the useable width below the minimum PAR width. Obstructions that are mounted to fixed objects, delineated, or marked will typically reduce the actual PAR Width available for all users.

3.7.3 Vertical Clearance

The Minimum Standard for vertical clearance under regulatory, warning or guide traffic signs is 84 inches above the PAR surface or in accordance with the regulations found in the Delaware Manual of Uniform Traffic Control Devices (DE MUTCD) current edition. The Minimum Standard for vertical clearance under general obstructions is 80 inches above the PAR surface, as illustrated in Figure 3.2 and Figure 3.7.3. The Minimum Standard for vertical clearance along an SUP is increased to 96 inches. Objects that protrude into the Overhead space above the required Vertical Clearance (varies from 80 to 96 inches per object and facility type), are permissible.

Figure 3.7.3 PAR Minimum Vertical Clearance

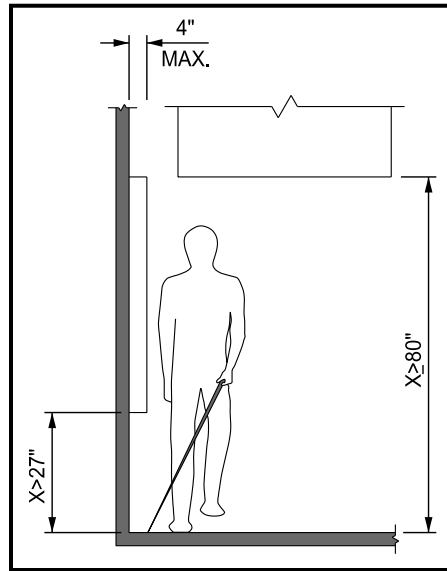


3.7.4 Protruding Objects

Objects mounted on fixed structures where the objects' leading edges protrude into the PCP above the cane detectable range and below the required Vertical Clearance (for example protruding edge occurs between 27 inches and 80 inches above the pedestrian facility's surface) shall meet the Minimum Standard of 4 inches maximum protrusion, measured from the face of the fixed structure into the PCP. (See protruding objects mounted on fixed structures in Figure 3.2, Figure 3.7.4, and Figure 3.8.6-a)

PAR Minimum Standards along a SUP require that no overhanging or protruding objects impact any portion of a shared use path at or below 96 inches. At the time of final inspection for SUP facilities, the Minimum Standard is 120 inches for overhanging vegetation such as tree limbs to allow for future growth.

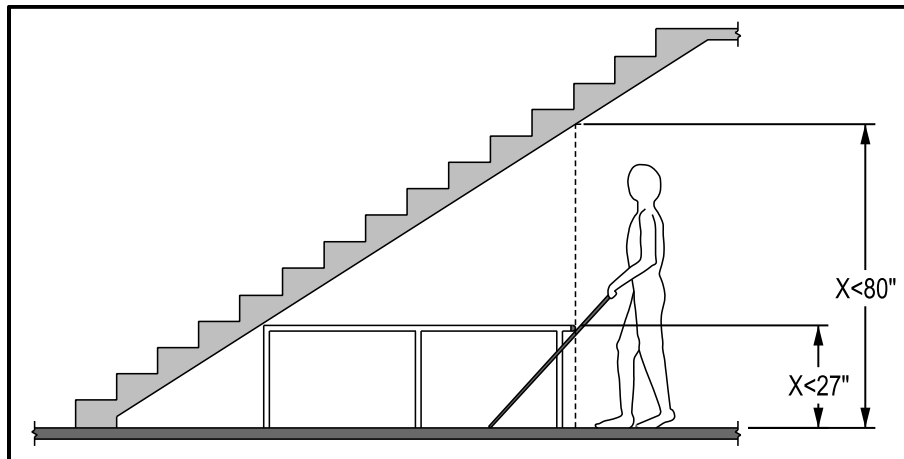
Figure 3.7.4 Limits of Protruding Objects



3.7.5 Barricades and Detectable Indicators

Fixed barricades or detectable indicators (see Section 3.7.2 regarding cane detectable features) are required where protruding objects extend more than 4 inches out from a fixed structure and/or where the vertical clearance is less than 80 inches such as at open stairways and along sloped or curved walls. Barricades and indicators must have detectable elements provided between the PAR surface level and a height of 27 inches so that they are within cane sweep and high enough not to be mistaken for a step or change in elevation. Fixed planters, benches, railing and other elements can be used as illustrated in Figure 3.7.5.

Figure 3.7.5 Barricade (Detectable Indicator) for Reduced Vertical Clearance

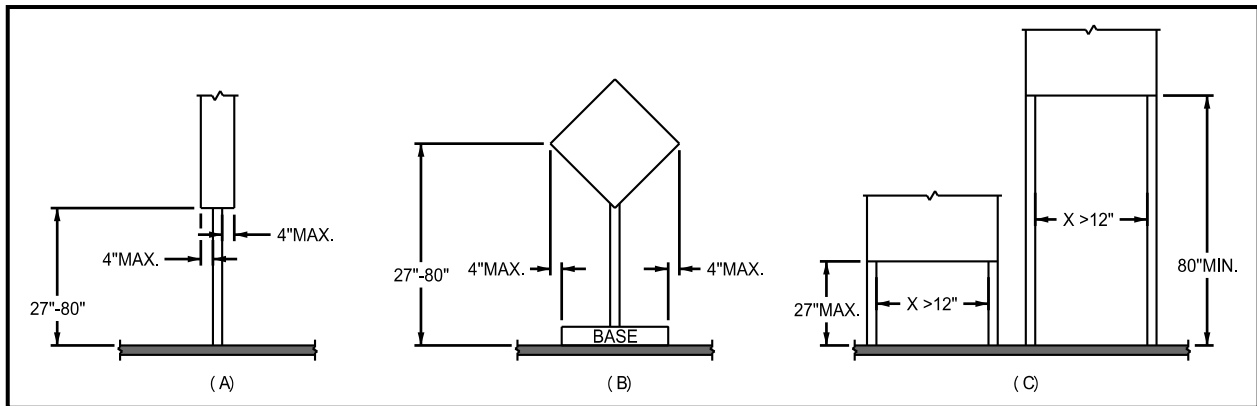


3.7.6 Post-Mounted Objects

Signs mounted on posts or pylons with leading edges that protrude at a height above the cane detectable range (more than 27 inches above the PCP surface and below the required vertical clearance) cannot protrude more than 4 inches out into the PCP per the DE MUTCD. The

Minimum Standard for general (non-signage) objects mounted on structures, posts or pylons with objects' leading edges that protrude at a height above the cane detectable range (more than 27 inches above the PAR surface and below the required vertical clearance) cannot protrude more than 4 inches out into the PCP, unless a detectable barricade is provided to alert the visually impaired user of the hazard. The overhang for protruding objects shall be measured from the post, detectable indicator, or base. If a detectable indicator or base is used, it shall be a minimum 2.5 inches thick and placed high enough not to be mistaken for a step or change in elevation. The minimum clearance between multiple posts (excluding the sloping portions of handrails) is 12 inches. See Figure 3.7.6 for examples.

Figure 3.7.6 Post-Mounted Objects



NOTE: the 80" dim. for vertical clearance varies with facility type, see Section 3.7.3

3.7.7 Handrails

Where provided in the public ROW, handrails for stairs and site access ramps (including those serving adjacent facilities and building entrances) shall comply with ADA requirements, and United States Access Board's published best practices. Designers shall provide additional PAR width and maneuvering space, to account for required handrails and/or handrail extensions, to ensure the width of the PAR is not reduced and protruding objects are compliant. In alterations of existing facilities, where adding handrail extensions would reduce the clear width required for an existing PAR, handrail extensions shall not be required.

3.7.8 Doors, Doorways, and Gates

Doors, doorways, and gates provided at pedestrian facilities (except for along shared use paths) shall comply with 36 CFR Part 1191 (ADAAG) and section 404 of Appendix D to 36 CFR Part 1191.

3.7.9 Stairways and Site Access Ramps

Where provided in the public ROW, stairways and site access ramps (including those serving adjacent facilities and building entrances) shall comply with ADA requirements, and United States Access Board's published best practices.

3.8 Accessible Pedestrian Connections to Street Level Crossings and Vehicular Crossings

Compliant accessible pedestrian connections (such as blended transitions or curb ramps) are essential components of accessible pedestrian networks, and provide connections from street level crossings or vehicular crossings (including Commercial Entrances) to the nearby sidewalk level PAR or SUP (where curb cut-throughs, curb crossings or elevation differences are present between the street or vehicular crossing and sidewalk or SUP). As part of New Construction, Reconstruction, and 3R Projects, curb ramps, blended transitions, and/or other accessible pedestrian connections shall be installed at locations where pedestrian facilities are being created, or already exist but are impacted by the proposed project. PAR Minimum Standards must be accounted for when planning 3R projects that require the installation of compliant accessible pedestrian connections and removal of roadside barriers that impede access to existing PAR and PCP networks. Where a pedestrian facility, (such as a sidewalk or SUP), is intersected by a curb at an approved street crossing location, a compliant blended transition or compliant curb ramp incorporating DeDOT's design standards is required and shall be constructed of concrete or other approved materials. Curb height is not intended to drive the selection of accessible pedestrian connection elements, and varying or lowering the curb height should be considered where designing a curb ramp could be avoided and a blended transition could be provided.

3.8.1 Blended Transitions

Blended Transitions with gently sloped segments (featuring running slopes that meet the Minimum Standard of 20H:1V (5.0%) or flatter) should be considered as a primary design option to provide accessible pedestrian connections. Blended Transitions should be considered where there is a reasonable ability to avoid the creation of ramped segments and abrupt elevation changes between the level of the street level or vehicular crossing and the adjacent sidewalk or SUP.

3.8.2 Curb Ramps

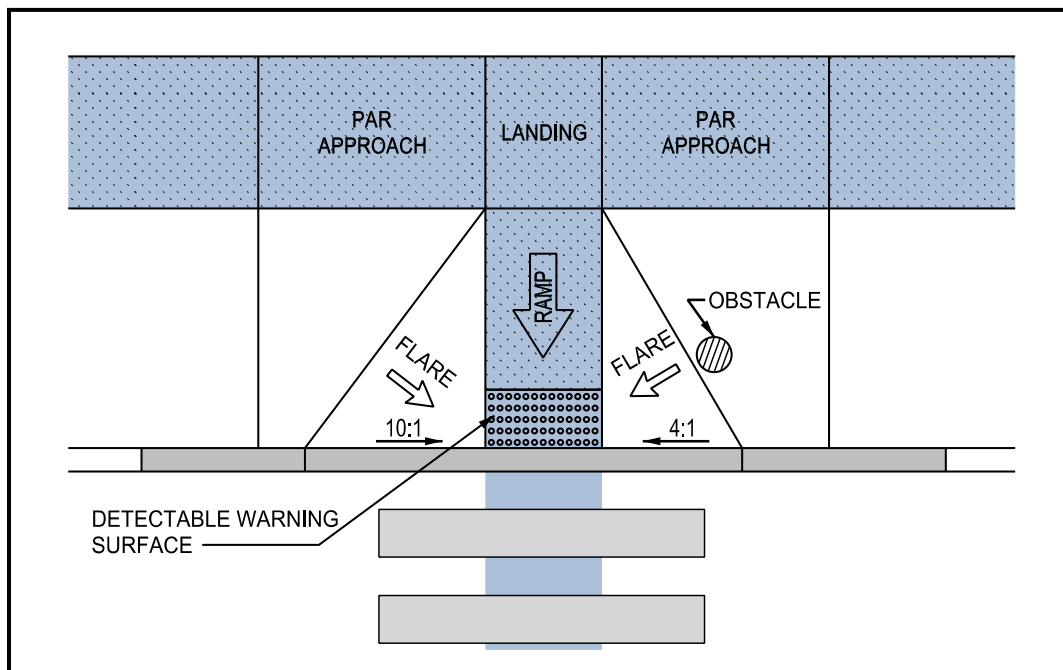
Curb ramps with moderate ramped segments (featuring running slopes that meet the Minimum Standard of 12H:1V (8.3%) or flatter) should be considered as a secondary design option to provide accessible pedestrian connections and limited in use to locations that are constrained (where the use of a blended transition becomes impracticable) making the use of ramped segments which are steeper than blended transitions necessary. Where the general slopes and elevations of a project allow for accessible connections to be designed with slopes that are 20H:1V (5.0%) or flatter, a blended transition shall be provided rather than introducing a curb ramp that requires back-to-back changes in running slope (in an effort to force a ramped segment to fit into the otherwise accessible surrounding slopes that are 5.0% or flatter). Designs that create a series of back-to-back changes in running slope have the effect of forcing all users to exert unnecessary effort to proceed along the path of travel (sometimes referred to as "building small hills" or "creating a roller coaster effect"). Curb height shall be evaluated as part of the design and varying or lowering the curb height should be considered where a curb ramp could be avoided. Curb ramps should only be considered where there is an abrupt elevation change between the level of the sidewalk or SUP and the adjacent street level or vehicular crossing. Evaluation of the specific need for "ramped segments" may allow designers to reduce the number of ramped segments that must be used and increase overall accessibility for a broad mix of users at many pedestrian connections by eliminating curb ramps, adding

blended transitions, and varying curb height or grass buffer width. Curb ramps are generally categorized by their design and how they are positioned relative to the sidewalk or street. (See Figure 3.8.2-a & Figure 3.8.2-b which follow Section 3.8.2.4.) Types covered in this chapter include the following:

3.8.2.1 Perpendicular Curb Ramps

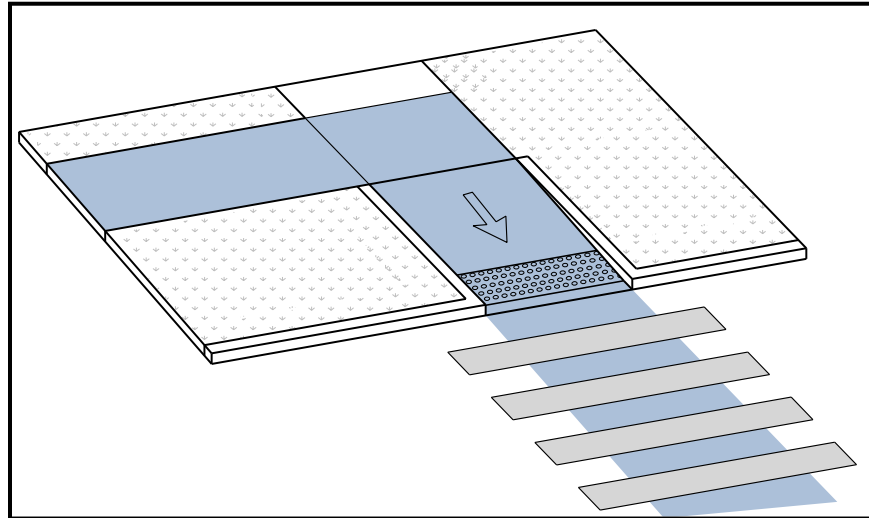
These are a design option used primarily where the PAR is separated from the back of curb with a buffer area (or non-walkable surface between the back of curb and sidewalk) or where multiple PAR approaches converge at pedestrian street crossings (and blended transitions will not provide sufficient slope to complete the required elevation transitions). The orientation of a perpendicular ramp requires users on the approach sidewalk to change direction (turning generally perpendicular to the original direction of travel) and leave the sidewalk route in order to access the ramped segment leading to the street level crossing. The design of a perpendicular ramp shall include a turning space or a landing area at the top of the ramp. The ramped segment is placed between the back of curb and the turning space. Designs with an approaching sidewalk, SUP, or ramped segment that incorporates a steep running slope (8.4% or steeper) leading into the area of the street or vehicular crossing shall be designed with an additional landing at the bottom of the ramp segment. See Figure 3.8.2.1-a for examples of specific curb ramp components such as the PAR approach, side flares, and detectable warning surface (DWS).

Figure 3.8.2.1-a Perpendicular Curb Ramp Components



NOTE: the PAR approach (which turns perpendicular to enter the ramp) is shaded blue

Figure 3.8.2.1-b Alternate Perpendicular Curb Ramp Orientation



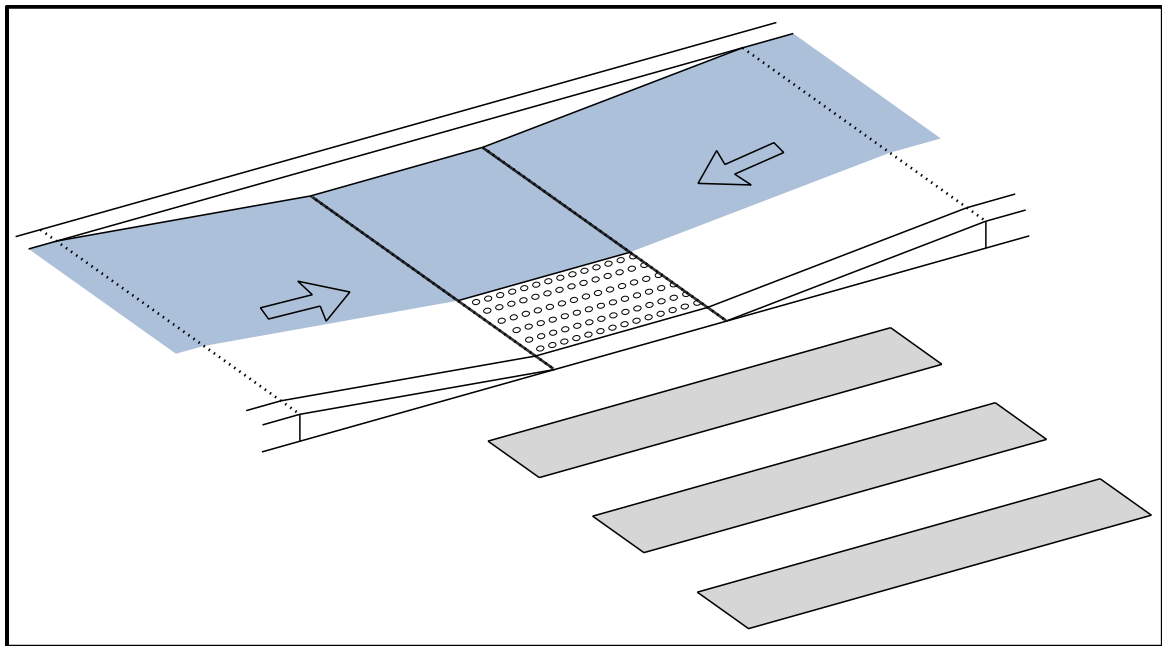
NOTE: the PAR approach (which turns perpendicular to enter the ramp) is shaded blue

- A.** Designs that are aligned with a ramped segment which is generally perpendicular to the path of travel on the adjacent sidewalk or SUP (requiring a departure from the typical sidewalk travel direction to access the ramped segment leading to the street crossing) shall be designed as a perpendicular ramp with a turning space at the top of the ramp segment. Designs with ramped segment alignments that are skewed relative to the road being crossed or with curb openings elongated due to crossing large radius curbs should be evaluated to consider the addition of a blended transition at the bottom of the ramped segment to avoid drainage issues between the ramp and the gutter flow-line.
- B.** Designs that include multiple sidewalk or SUP approaches which share a common PAR junction prior to connecting to street crossing(s) shall be designed with accessible pedestrian connection(s) configured as blended transition(s) or as perpendicular ramp(s) with a turning space or landing at the top of the ramp segment(s). Designs with alignments skewed relative to the road being crossed or with curb openings elongated due to crossing large radius curbs should consider the addition of a blended transition at the bottom of the ramped segment to avoid drainage issues between the ramp and the gutter flow-line.
- C.** Designs with a single sidewalk or SUP approach and a single accessible pedestrian connection serving a single street crossing shall be evaluated for potential to design as blended transitions or as parallel ramps (rather than as perpendicular ramps: see Section 3.8.2.2.B) to the extent practicable (regardless of the orientation of the ramped segment relative to the direction of travel in the adjacent street level or vehicular crossing).

3.8.2.2 Parallel Curb Ramps

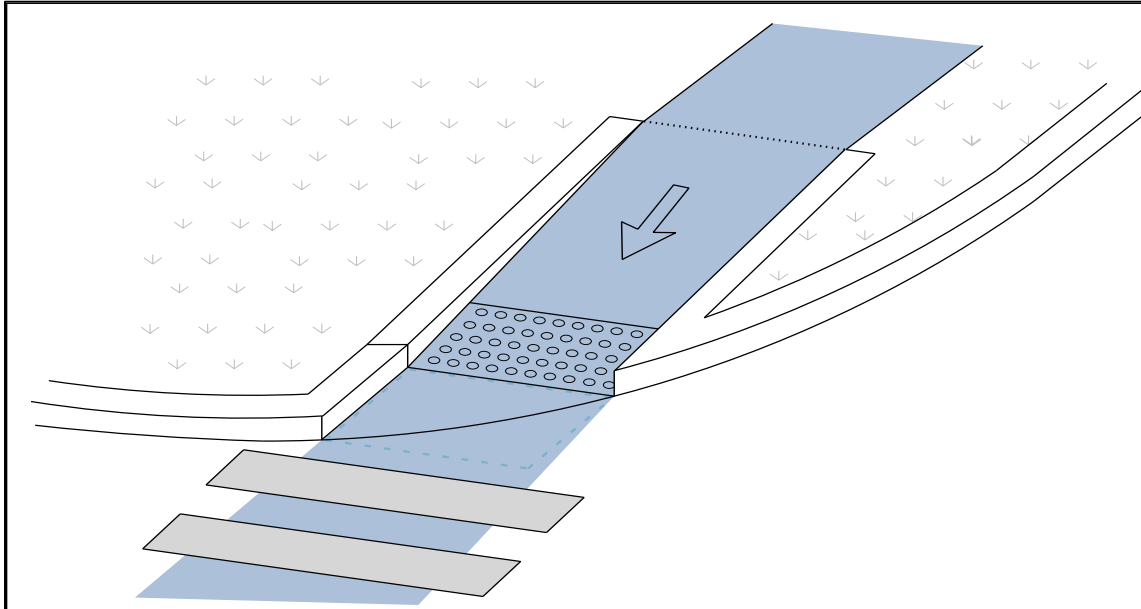
These are a design option used primarily where the PAR is adjacent to back of curb and/or where there is little or no buffer area between the back of curb and sidewalk (and where blended transitions will not provide sufficient slope to complete the required elevation transitions). The use of a parallel ramp design requires consideration of the increased effort required from many users, including persons with disabilities, because all users following the typical PCP travel direction are required to navigate the ramp slopes regardless of their destination. The orientation of a parallel ramp requires all users on the approach sidewalk to traverse the ramped segment (continuing generally parallel with the original direction of travel) without leaving the sidewalk route. The design of a parallel ramp may include paired or single ramped segments and shall include a turning space, a landing, or a clear space at the bottom of the ramped segment.

Figure 3.8.2.2-a Dual Approach - Parallel Curb Ramp Orientation



NOTE: the PAR approach (which runs parallel through the ramp) is shaded blue

Figure 3.8.2.2-b Single Approach - Parallel Curb Ramp Orientation



NOTE: the PAR approach (which runs parallel through the ramp) is shaded blue

- A. Designs with an approaching sidewalk, SUP, or ramped segment that incorporates a steep running slope (8.4% or steeper) leading into the area of the street or vehicular crossing should be designed as a parallel ramp (to the extent practicable) with a turning space or landing at the bottom of the ramp segment (the turning space or landing should be entirely behind the curb-line). For designs with a single sidewalk or SUP approach, where no turning space would otherwise be required at the top of the ramp segment, an additional landing at the top of the ramp is not required (unless the running slope of the contiguous sidewalk or SUP exceeds 5.0%).
- B. Designs with a single sidewalk or SUP approach (and a single accessible pedestrian connection serving a single street crossing) that are aligned with the running slope generally parallel to the path of travel on the approaching sidewalk or SUP (and aligned as an extension of the approaching sidewalk or SUP) should be designed as a blended transition or a parallel ramp (regardless of the orientation of the ramped segment relative to the direction of travel in the adjacent street level or vehicular crossing) with a turning space or landing at the bottom of the ramp segment (the turning space or landing should be entirely behind the curb-line).

3.8.2.3 Combination Curb Ramps

These are a design option used where there are steep grades along the PAR or curb height requires increasing the length of approach ramps. Each combined curb ramp resembles a combined parallel and perpendicular curb ramp, and includes key characteristics of each type. Uses the concept of a parallel ramp to introduce ramp(s) on approach(es) to the landing, (to lower the landing's elevation), and uses a perpendicular ramp, (to bridge the elevation difference between the landing and depressed curb).

3.8.2.4 Diagonal Curb Ramps

Diagonal curb ramps are located along the corner radius and have the potential to orient a user's direction of travel toward the center of the intersection. Diagonal curb ramps are a less desirable design option and should only be used where conditions prohibit the use of other types of alternative designs or combination pedestrian connection layouts. When it is not practicable for a New Construction project to avoid the creation of diagonal curb ramps, the designer should document the reason that the diagonal orientation was required at each location. Designers should not perpetuate existing diagonal curb ramps without a documented constraint or written justification supporting the use of diagonal curb ramps within the context of the project type and project scope. Any documentation related to the use of diagonal curb ramps shall be retained by the Designer as part of the project file. Diagonal curb ramps are required to provide a Clear Space (see Figure 3.8.4) that is 48" min. in length, measured in the direction of travel, at the bottom of the ramp segment. The Clear Space shall be located outside of active vehicle traffic lanes and shall be located within marked crosswalks, where provided.

Figure 3.8.2-a Curb Ramp Type Examples

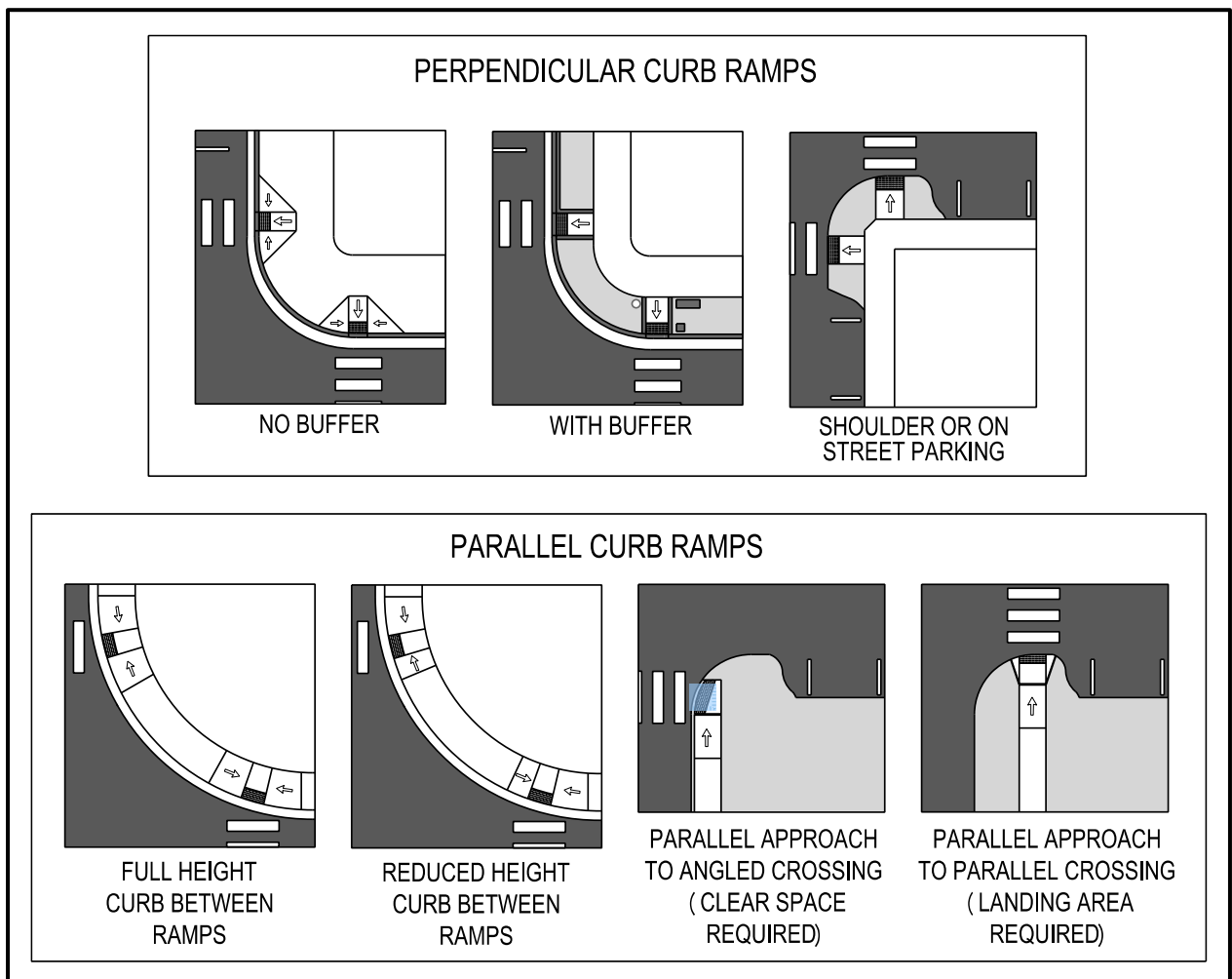
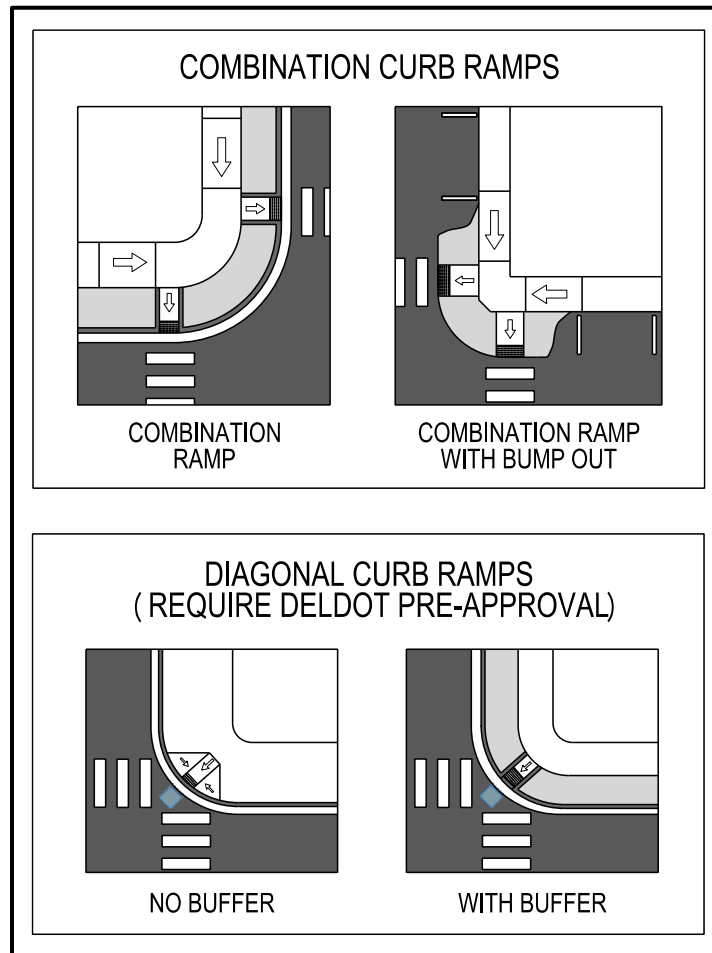


Figure 3.8.2-b Curb Ramp Type Examples (continued)



3.8.3 Accessible Pedestrian Connection Layout

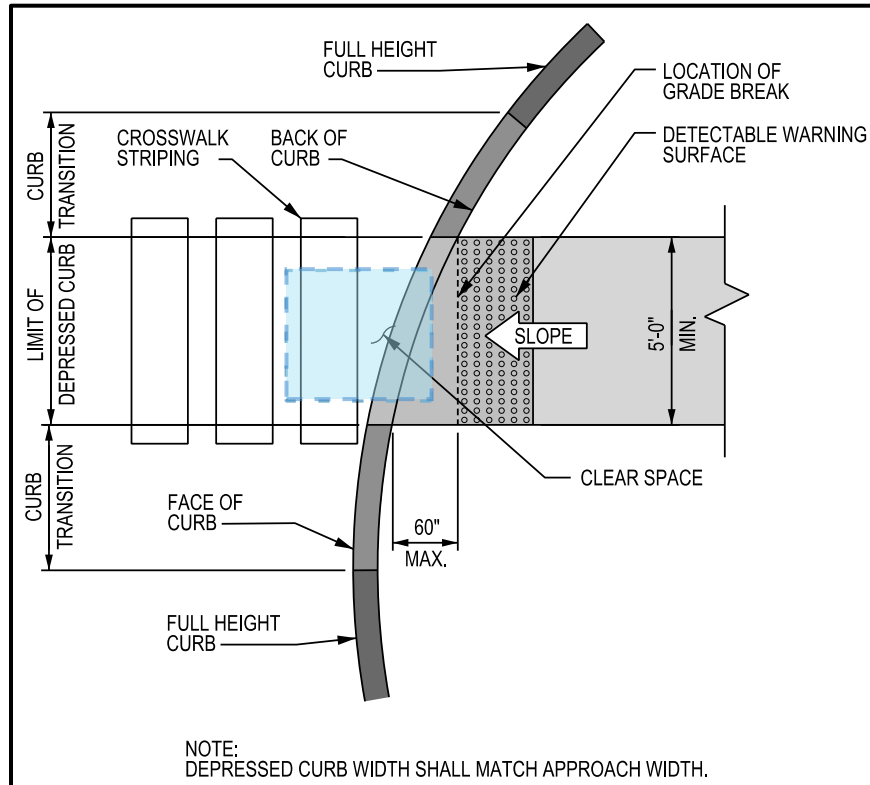
For blended transition or curb ramp layouts, designers must first evaluate the ability to install a pair of separate accessible pedestrian connections (such as blended transitions and/or curb ramps) on each corner. Keeping accessible pedestrian connections separate and avoiding the use of diagonal connections will provide clarity for a wide range of users including persons with disabilities. The use of parallel and/or alternative designs including combinations of blended transitions and/or curb ramps may be acceptable if separate blended transitions or perpendicular curb ramps are not practicable to design or construct based on existing constraints and available ROW.

3.8.4 Accessible Pedestrian Connection Orientation

Ramped segments leading into the street level or vehicular crossing should be designed generally in-line or on alignment with the direction of pedestrian travel at street crossings (to provide smoother travel for wheeled mobility device users). The ramped segment leading to the street crossing shall be perpendicular to the grade break at the toe of the ramp to ensure wheelchair stability. If the curb ramp is placed on a radius, design should evaluate the ability to install a perpendicular grade break, (at the edge of the DWS), located behind the curb, with no part of the grade break farther than 5 feet from the back of curb (see Figure 3.8.4). An RPE

should be considered for locations where the use of a perpendicular grade break or perpendicular DWS (with one end of the grade break or DWS located farther than 5 feet from the back of the curb) would result in a layout with increased overall accessibility for a broad mix of users. Blended transitions, curb ramps, and depressed curb (not including the flares) shall be oriented centrally, to align between the outside edges of the crosswalk striping.

Figure 3.8.4 Grade Break at Toe of Ramp / Alternative Curb Ramp Design



3.8.5 Pedestrian Connection Optimization Criteria

3.8.5.1 Minimize Crossing Distance

Blended transitions or curb ramps should be located to reduce pedestrian crossing lengths and minimize pedestrian exposure to traffic.

3.8.5.2 Drainage Design

Drainage conditions shall be considered when designing blended transitions or curb ramps to avoid or correct existing ponding conditions. When a blended transitions or curb ramp is adjacent to a drainage inlet where ponding occurs, and the ponding cannot be corrected by modifying the throat of the drainage inlet, the designer should pursue relocation of the PAR and/or drainage facilities.

3.8.5.3 Drainage and Roadway Slopes

The longitudinal slope of gutter pans and/or roadway surfaces establish or affect the cross-slope of the PAR at crossing locations. Design of the PAR shall account for these roadway related slope issues. Design should avoid crossing locations that would force the PAR cross slope to exceed 5.0%.

3.8.5.4 Drainage Grate Location

On New and Reconstruction Projects drainage grates shall be located outside of the PAR. On 3R and Maintenance Projects drainage grates should be avoided when establishing the PAR. When drainage grates cannot be avoided or relocated based on the project type and project scope, the DelDOT internal Project Manager shall be: notified in writing, provided with documentation of the constraints citing the specific impacts on accessibility, and asked to provide written consent prior to design or construction of the PAR which will cross the drainage grates. Required documentation varies by project type: New and Reconstruction Projects are required to complete the formal RPE process as described in Chapter 4 including obtaining DelDOT approval of the RPE and adding notes related to the RPE in the construction plans and as-built drawings; 3R and Maintenance Projects are required to retain documentation and copies of the written notification provided to the DelDOT Project Manager. Where the PAR crosses drainage inlets, the grates used must be DelDOT approved, accessible grates (See DelDOT's Standard Construction Details).

3.8.5.5 Surface Utility Covers

Design priority is given to locating the PAR where surface utility-covers and property access covers will not conflict with crosswalks, blended transitions, or curb ramps. See Section 3.4.9 for guidance and accessible cover requirements.

3.8.6 Alternate Pedestrian Connection Locations

In locations with unusual constraints or many features/obstructions in the built environment where the DelDOT Standard Construction Details for new construction pedestrian connection designs are not applicable, the construction plans should include detailed layout designs with dimensions and slopes that meet the PAS standards for blended transitions, ramps, flares, and landing areas (see DelDOT Model Plans for 3R and alteration projects for examples of these features in the built environment). The design layout must ensure that the improvements and any relocated facilities will be contained within public ROW or appropriate easements. Figures 3.8.6-a and 3.8.6-b illustrate some alternative treatments for several pedestrian connection components that may be incorporated successfully at perpendicular and/or parallel pedestrian connections where constraints exist. The use of engineering judgment must be implemented when there are overlapping constraints that present complex design challenges. Alternative designs should balance the needs of all users. Alternative designs which attempt to meet the intent of the PAS design standards may include some required PAR features that fall slightly out of compliance. The alternative design is considered a more favorable design if it allows for common use by a more diverse population of users including many persons with disabilities as compared to a design that only has one feature that is extremely out of compliance and would pose a broader barrier to accessibility. Designers must apply particular care where pedestrian safety and/or operational safety of adjacent traffic may be impacted by the limited compliance of the alternative design. Alternative designs should be documented in the project file, and noted on the plans as an alternative design that has been implemented to create a balanced design for the unique set of conditions encountered. (Designers should retain documentation related to the specifics of the alternative design and copies of the written notification provided to DelDOT's internal Project Manager related to the use of the alternative design at individual locations and the constraints that impacted overall accessibility of each design.)

Figure 3.8.6-a Alternative Treatments for Perpendicular Sidewalk Approaches

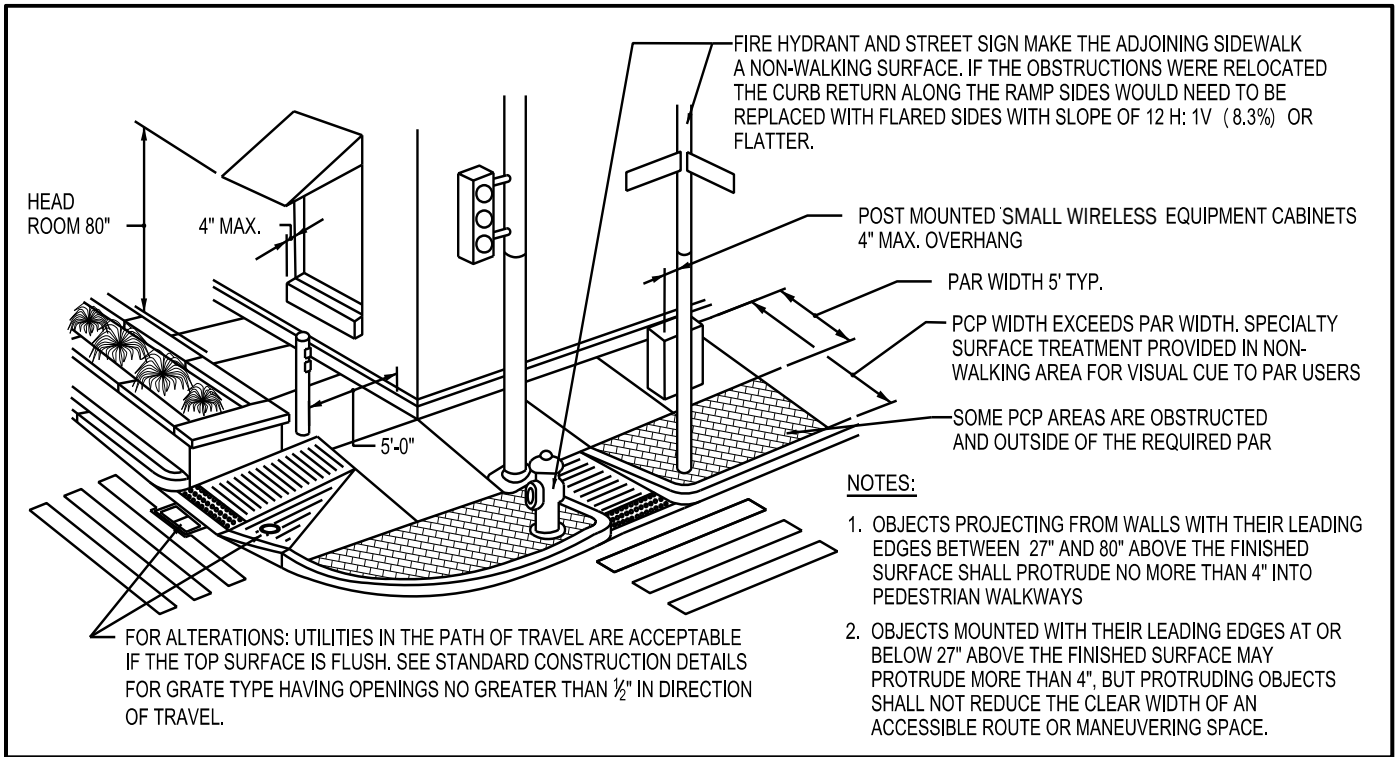
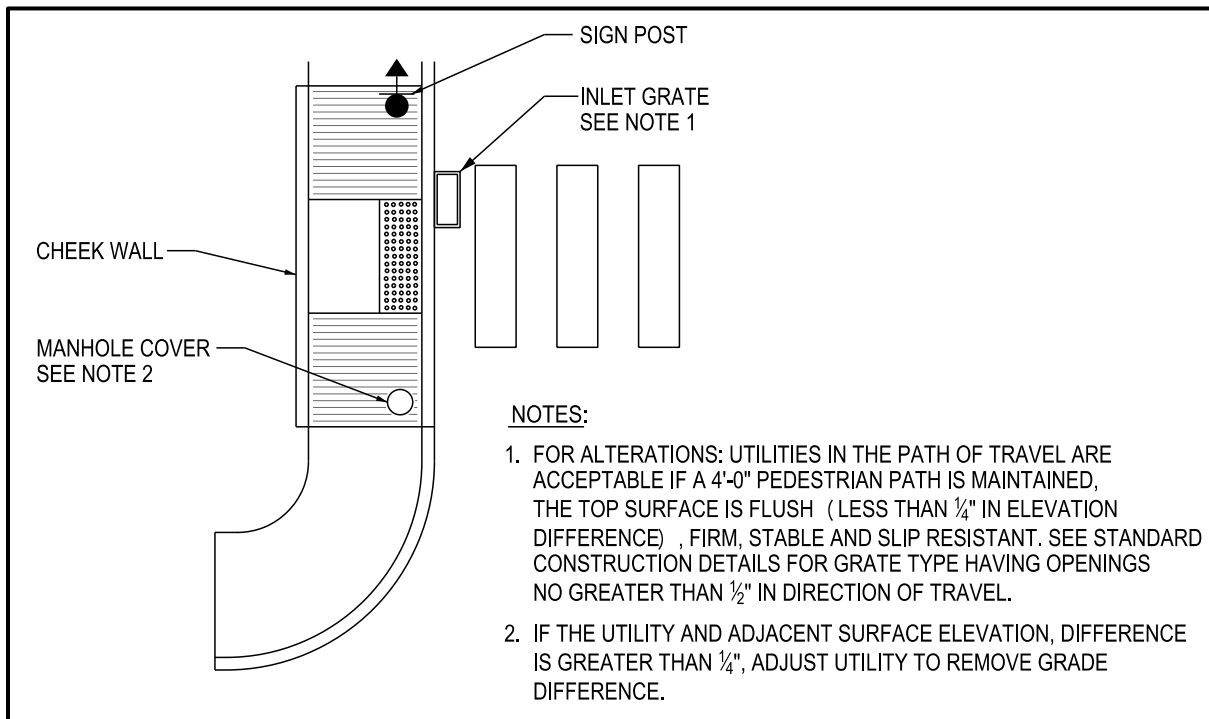


Figure 3.8.6-b Alternative Treatments for Parallel Sidewalk Approaches



3.8.7 Pedestrian Connection Guidelines and Criteria for Alternative Design

The following principles shall be followed for the application of standards and guidelines for alternative designs:

3.8.7.1 Pedestrian Connection Width

The Desired Standard for blended transition width and curb ramp width is 5 feet, or matching the approach PAR or SUP width. The Minimum Standard for blended transition width and curb ramp width is 4 feet. Wider features or ramps may be needed in areas with high pedestrian volumes. Blended transitions or curb ramps provided at shared use paths or trails shall be at least as wide as the path or trail being served.

3.8.7.2 Pedestrian Connection Cross Slope

The cross slope of pedestrian connections will typically match the slope of the adjacent street level pedestrian crossing (see Section 3.10.2 regarding the standards for cross slope of crosswalks). The Minimum Standard for cross slope on pedestrian connections is determined by the traffic controls present on the leg of the intersection being designed, and the Project Type. See Sections 3.10.2.1, 3.10.2.2 and 3.10.2.3 for specific Minimum Standards for crosswalk cross slopes (which shall also be applicable by extension to cross slopes of pedestrian connections for New Construction and 3R Projects).

In some cases, especially alteration and retrofit work, the roadway's existing longitudinal profile adjacent to the depressed curb and in front of a blended transition or curb ramp may exceed the applicable Minimum Standards for cross slope (found in Section 3.10.2). Where only a single sidewalk approach connects to the blended transition or curb ramp (see Figure 3.8.7.2-a) it can be helpful to the match cross slope of the roadway longitudinal slope encountered at the back of curb and carry that slope through the pedestrian connection and turning space or landing area, subject to the following limitations.

- A.** On New Construction projects and intersection Reconstruction projects, the designer should strive to achieve a maximum turning space/landing area cross slope of 2.0%.
- B.** In constrained areas of 3R projects, and Reconstruction projects, the designer should strive to achieve a reasonable turning space/landing cross slope, considering the scope of the project, the terrain, and physical constraints such as structures. Crosswalk cross slopes in excess of 5.0% should be avoided where practicable.
- C.** Transition slabs are required to connect sidewalks to turning spaces/landing areas with slopes that exceed 2.0%

Where multiple sidewalk approaches connect at a turning space (see Figure 3.8.7.2-b) it can be helpful to gradually transition the ramp's cross slope from the roadway longitudinal slope encountered at the back of curb to a compliant 2.0% cross slope adjacent to the turning space or landing area. The cross slope transition will begin behind the DWS and the transition rate shall not exceed 3.0% per foot. For example, if the roadway profile slope is -8.0%, then the transition length must be at least 2 feet to change to a -2.0% cross slope adjacent to the turning space. Depressed curb shall be constructed per Section 3.8.7.8 and the flowline slope should match the adjacent roadway profile slope to the extent practicable.

Figure 3.8.7.2-a Alteration Project: Landing Area Transition to Roadway

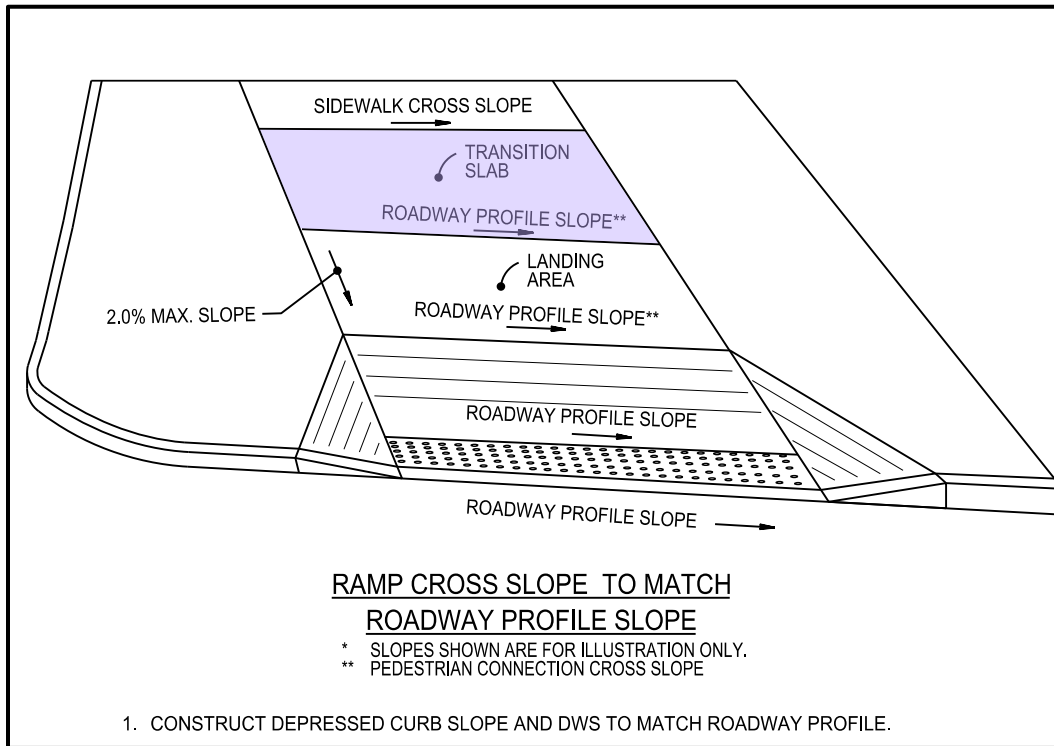
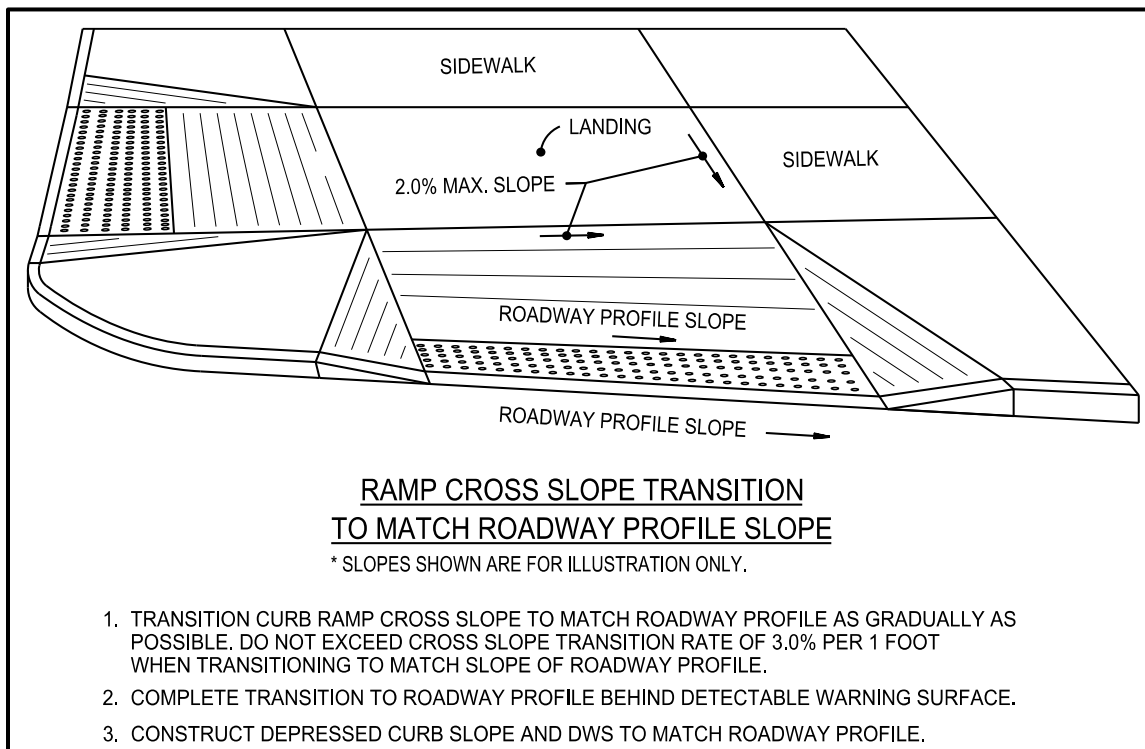


Figure 3.8.7.2-b Turning Space: Cross Slope Transition to Roadway



3.8.7.3 Curb Ramp Running Slope

The Minimum Standard for curb ramp running slopes on all projects is 12H :1V (8.3%) or flatter, except where existing roadway profile slope and adjacent sidewalk running slopes create a chasing grade scenario (see Section 3.8.7.5).

3.8.7.4 Curb Ramp Grade Breaks

Grade breaks at the top and bottom of ramped segments (with slopes that exceed 5.0%) shall be perpendicular to the direction of travel along the ramped segment. Figure 3.9.3.1 depicts a lower grade break, located with no portion of the grade break more than 5 feet from the back of curb. If one end of the grade break is designed to be more than 5 feet from the back of curb an approved RPE shall be obtained or the DWS shall be placed at the back of the depressed curb. Grade breaks must occur at top and/or bottom of ramp segments and are not permitted; on the surface of blended transitions or curb ramps, within landings, or within gutter areas along the PAR.

3.8.7.5 Length of Ramp Segments Chasing Road Slopes

The length of the ramp segment needed depends upon the height of the curb and slope of the adjoining roadway and sidewalk or pedestrian facility. Where surrounding grade/slope or adjacent roadway profile slope requires that the running slope of the sidewalk exceed 5.0% approaching a curb ramp, turning space, or landing area, the length of the ramp segment needed is not required to exceed 15 feet. When transitioning pedestrians from street level crossings or vehicular crossings (including Commercial Entrances) to the nearby sidewalk level on a steep street, it is not necessary to chase the grade and the ramp segment is not required to exceed 15 feet in length, regardless of the resulting running slope within that ramp segment. The running slope of this ramp segment can be steeper than 8.3% when necessary to achieve a connection from the street level connection, turning space, or landing to the adjacent sidewalk/SUP. In practice, the ramp segment should be extended to the next joint beyond 15 feet, and a transition slab that is 5 feet or longer should be provided which matches the sidewalk running slope of the adjacent existing sidewalk/SUP running slope, (if needed to transition from the ramp cross slope or width to meet the width or cross slope of the existing sidewalk/SUP).

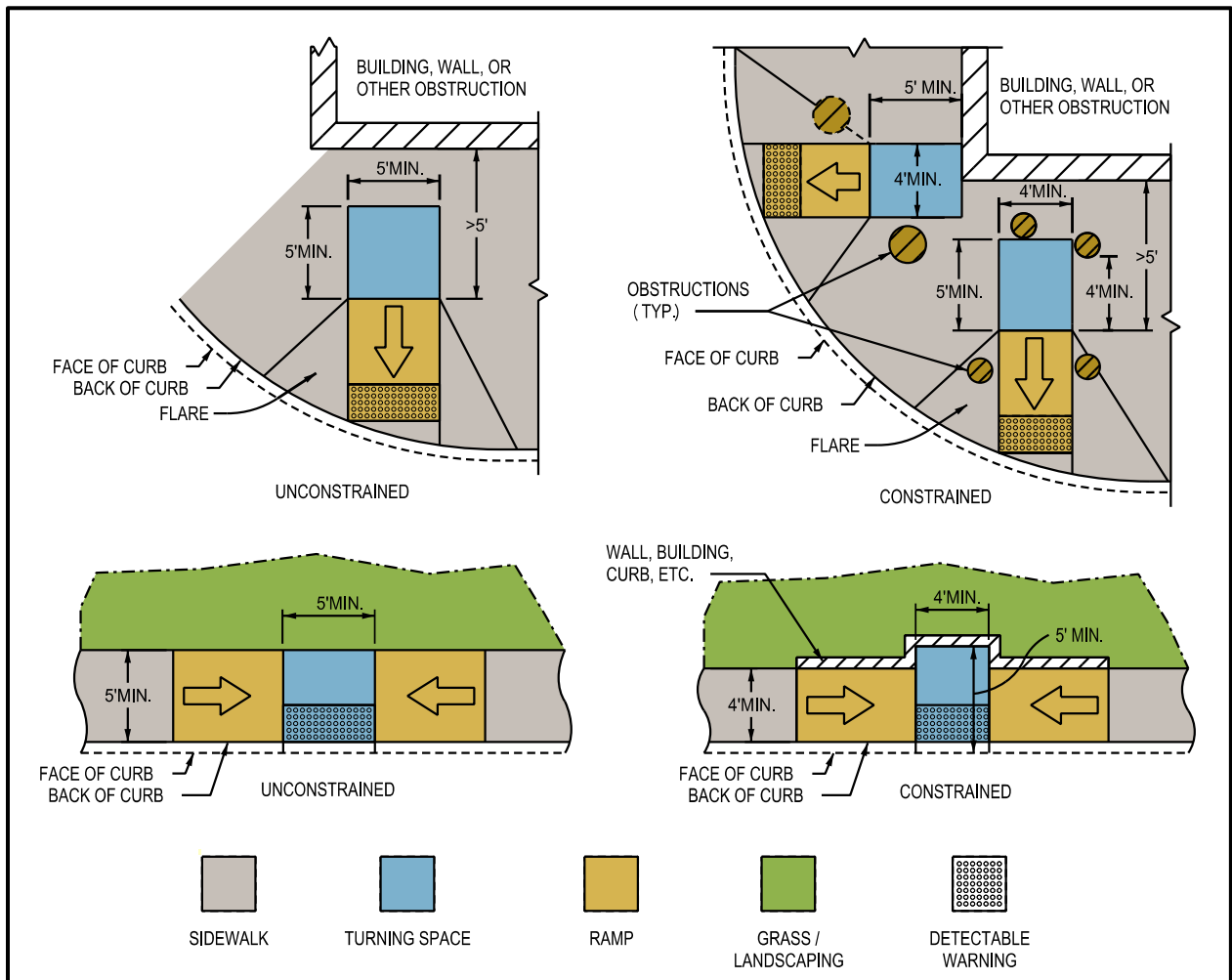
3.8.7.6 Curb Ramp Side Flares

The Minimum Standard requires that side flare slopes be designed at 10H:1V (10.0%) or flatter when measured parallel with the back of curb (i.e. taper curb at 10H:1V or flatter where side flares are created) if they are located in the PAR. A side flare should be provided (rather than a returned curb or cheek-wall) where the PCP allows for pedestrians to approach the pedestrian street level connection directly from that side. Side flares shall not be used if the ramp is adjacent to a non-walking surface, such as where obstructions or hazards would impede the use of the side flare to connect par elements.

3.8.7.7 Curb Ramp Turning Spaces (Landing Areas)

Turning Spaces or Landing Areas having a maximum 50H:1V (2.0%) cross slope and a maximum 50H:1V (2.0%) running slope shall be provided as part of accessible pedestrian connections to street level crossings and vehicular crossings (where required per Section 3.8.2). These spaces are also required at the top of curb ramp segments where a change in pedestrian travel direction is required to access the ramped segment from the PAR and where a change in pedestrian travel direction would require mobility device users to reorient their device prior to departing from the travel direction along the PAR approach. Landing areas should be provided in-line with the direction of travel to allow a PAR user to remain stationary or rest momentarily where ramp segments connect to a sidewalk or SUP with a running slope that is steeper than 5.0%. The Desired Standard requires that turning spaces be 5 feet wide by 5 feet long or equal to the width of the PAR approach, if the PAR is greater than 5' wide. The Minimum Standard for turning spaces is 4 feet wide by 4 feet long (but must include required foot pedal overhang clearance where constraints could prevent turning maneuvers or foot pedal entrapment is likely). When a turning space is constrained on more than one side, or where the back of the turning space is constrained by a curb or other feature that projects more than 2 inches above the PAR surface (limiting foot pedal clearance) provide 5 feet in the direction of the pedestrian crossing as shown in Figure 3.8.7.7.

Figure 3.8.7.7 Unconstrained and Constrained Curb Ramp Landing Areas



3.8.7.8 Depressed Curb to Gutter Transition

The transition between the depressed curb at a blended transition or ramp segment and gutter shall be smooth and flush. The depressed curb shall be constructed in accordance with the DeIDOT Standard Construction Details to maintain positive drainage and the slope of the top of the depressed curb is permitted to match the running slope of the adjacent blended transition or curb ramp.

3.8.7.9 Pedestrian Connection Counter Slopes

The counter slope is commonly evaluated as the absolute algebraic grade difference (G) of two adjacent slopes. The formula for calculating G is as follows:

$$G = g2 - g1$$

With respect to pedestrian connections, the algebraic grade difference is the difference of the gutter pan side slope or crosswalk's running slope ($g2$), minus the blended transition's or curb ramp's running slope ($g1$), as illustrated in Figure 3.8.7.9-a. The +/- value of the slope is defined as (+) for uphill slopes and (-) for downhill slopes. Minimum Standard for counter slope grade changes in the path of travel is an algebraic difference of 13.3% or flatter, (running slope of curb ramps at -8.3% and gutter pan side slopes or crosswalk running slopes at +5.0%). When designing for the counter slope of curb ramp locations on New and Reconstruction Projects, the Desired Standard for absolute algebraic difference is 11.0% or flatter. If conditions on a perpendicular curb ramp result in the need to provide a counter slope greater than 13.3%, a transition landing area must be provided at the bottom of the curb ramp behind the curb. The transition landing must be as wide as the ramp, at a slope not to exceed 5.0%, and 2 feet in length, measured in the direction of travel. The DWS area can be included within this transition landing area, as illustrated in Figure 3.8.7.9-b.

Figure 3.8.7.9-a Counter Slope Limitations

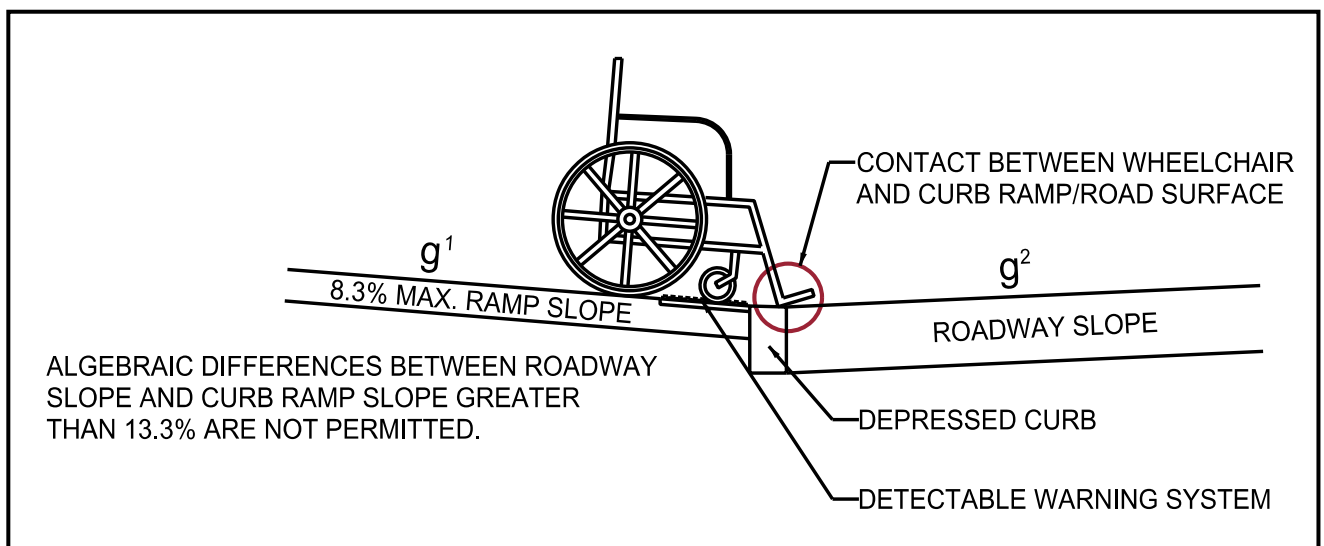
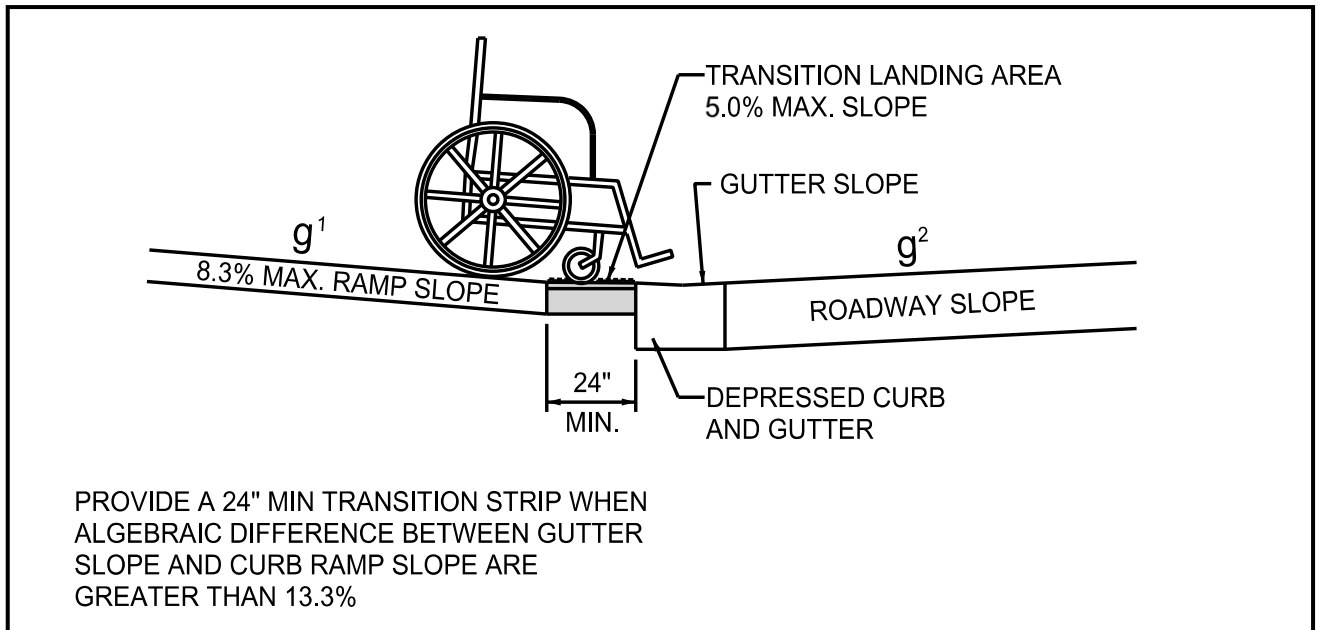


Figure 3.8.7.9-b Transition Strip Alternative for Excessive Counter Slope



The gutter pan side slopes of DelDOT’s common integral P.C.C. curb and gutter types vary as noted below:

- Existing Integral Curb - Type 1 = 7.6%
- Existing Integral Curb - Type 2 = 9.3%
- Existing Integral Curb - Type 3 = 6.8%

On New and Reconstruction Projects, the depressed curb at curb ramp locations shall be constructed per the Minimum Standard, with a 5.0% gutter pan side slope. On 3R Projects, curb ramp designs are permitted to utilize the existing/unaltered gutter pan side slope of the depressed integral curb and gutter. If the depressed curb and gutter is reconstructed during 3R Projects, DelDOT’s Desired Standard (11.0% counter slope) is applicable, when coordinating the design effort to optimize the gutter pan side slope to reduce the existing gutter pan side slope.

Design Example: For a 3R Project, a transition landing area may be needed adjacent to the depressed/flush curb as part of a perpendicular curb ramp design with a ramp running slope equal to -7.5%. The project design is proposing to leave the existing depressed P.C.C. curb and gutter, (“Type 1-8” per DelDOT’s Standard Construction Details) undisturbed, but connect the street crossing to a P.C.C. sidewalk that is 5 feet wide, and located behind a grass buffer area that is also 5 feet wide.

The need for a transition landing area must be determined:

$$G = g_2 - g_1$$

g_2 = gutter pan side slope = 7.6% (per DelDOT’s standard detail: Type 1-8)

g_1 = ramp running slope = -7.5%

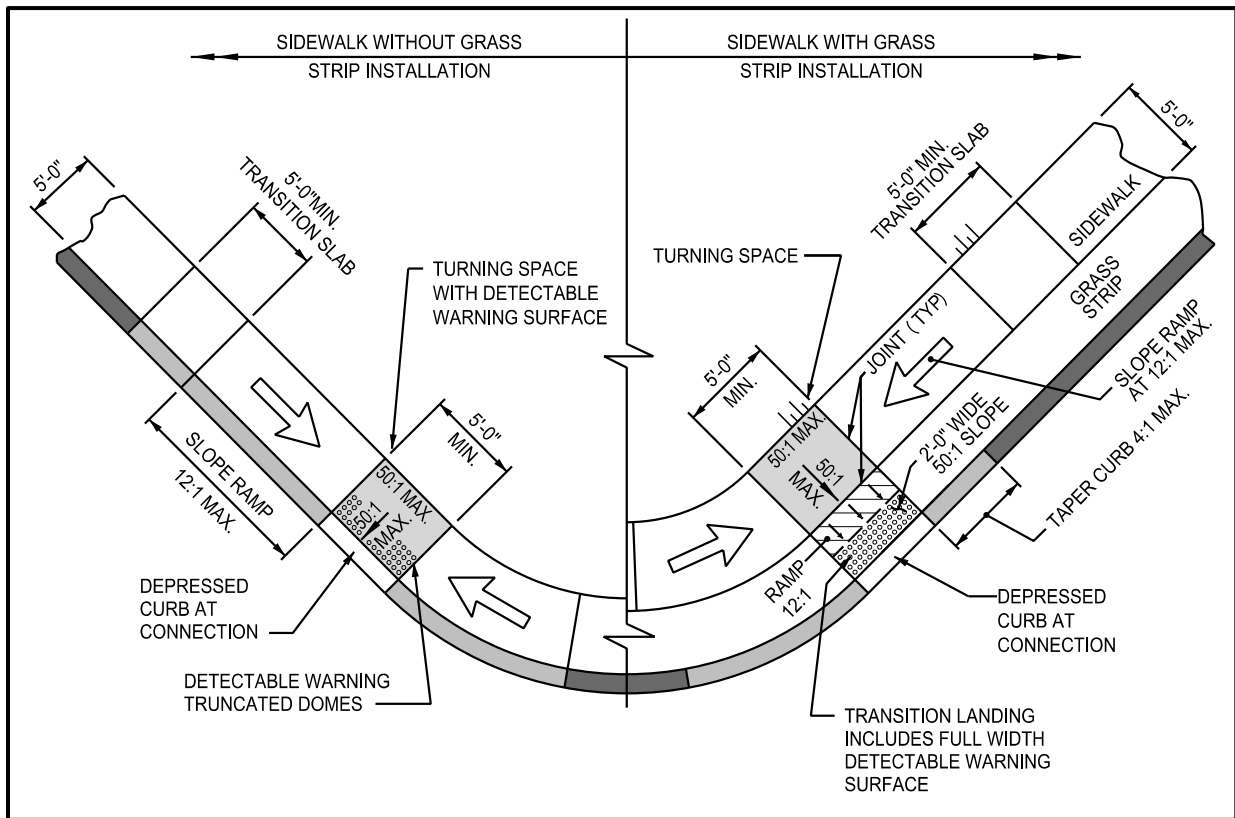
$G = 7.6\% - (-7.5\%) = 15.1\%$.

Since the 15.1% algebraic difference is greater than the 13.3% Minimum Standard for counter slope, a transition landing that is at least 2 feet in length, measured in the direction of travel, must be placed adjacent to the back of the depressed/flush curb. (See Figure 3.8.7.9-b above).

3.8.7.10 Alternative Designs for Counter Slope

Two alternative designs to meet the counter slope requirements are depicted in Figure 3.8.7.10. One option shows a parallel curb ramp (on the left side of the figure) with a compliant turning space or landing area (5 feet by 5 feet) adjacent to the back of curb and the other option shows a combination ramp (on the right side of the figure) adjacent to a grass buffer strip (non-walkable surface) using a transition landing that is 2 feet long, measured in the direction of travel, which is placed adjacent to the back of the depressed/flush curb. See DelDOT Standard Construction Details for additional guidance on these alternative designs.

Figure 3.8.7.10 Counter Slope Examples Adapted from DelDOT Standard Construction Details



3.9 Detectable Warning Surfaces (DWS or Truncated Domes)

Detectable Warning Surfaces (DWS), sometimes referred to as truncated domes, are a required feature at platform transit stops and at specific locations along a PAR, including on blended

transitions and/or curb ramps at all street crossings (and at select commercial entrances per Section 3.9.6), on pedestrian connections at marked crosswalk locations, at pedestrian refuge islands, at boarding and alighting areas at platforms, at sidewalks or at street level transit stops, and at pedestrian crossings of railroad tracks. DWS installation requirements are described below:

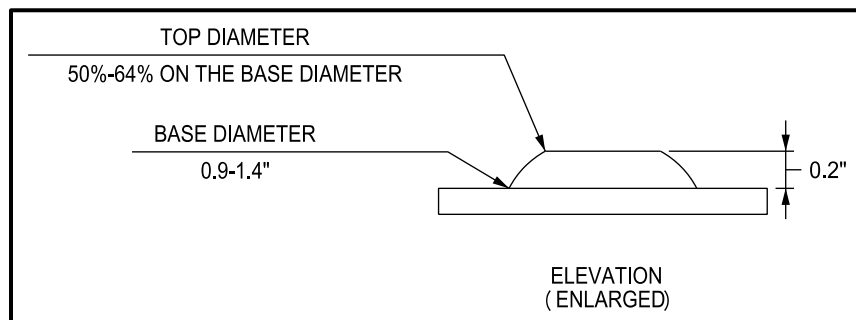
3.9.1 DWS Color Contrast

DWS color shall contrast visually with adjacent PAR surface, gutter, roadway, and pavement, and shall provide either light-on-dark or dark-on-light contrast. Unless specifically authorized by DeIDOT at a specific location, curb ramps shall be constructed with un-pigmented (natural colored) Portland cement concrete and shall be equipped with contrasting DWS per DeIDOT Standard Specifications.

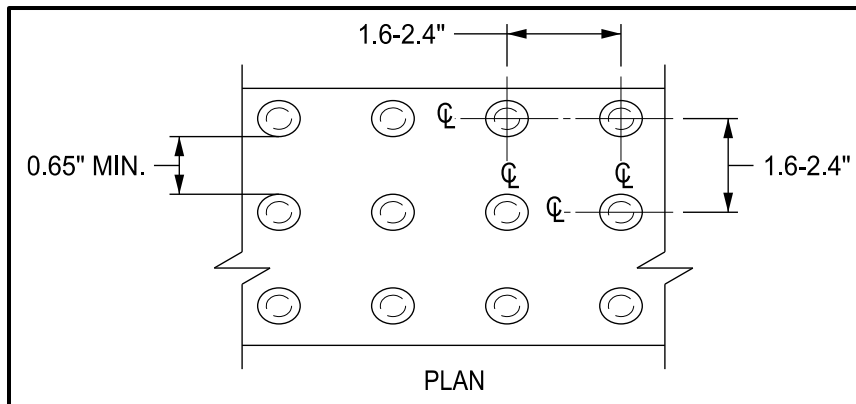
3.9.2 DWS Dome Size and Spacing

The truncated domes that are used in the DWS shall have a base diameter between 0.9 inch (minimum) and 1.4 inches (maximum), a top diameter that is between 50 percent of the base diameter (minimum) and 65 percent of the base diameter (maximum), and a total height of 0.2 inch. The truncated domes shall have a center-to-center spacing between 1.6 inches (minimum) and 2.4 inches (maximum), and a base-to-base spacing of at least 0.65 inch (minimum), measured between directly adjacent domes, as illustrated in Figure 3.9.2.

Figure 3.9.2 Truncated Domes Used in Detectable Warning Surfaces



Dome Size



Dome Spacing

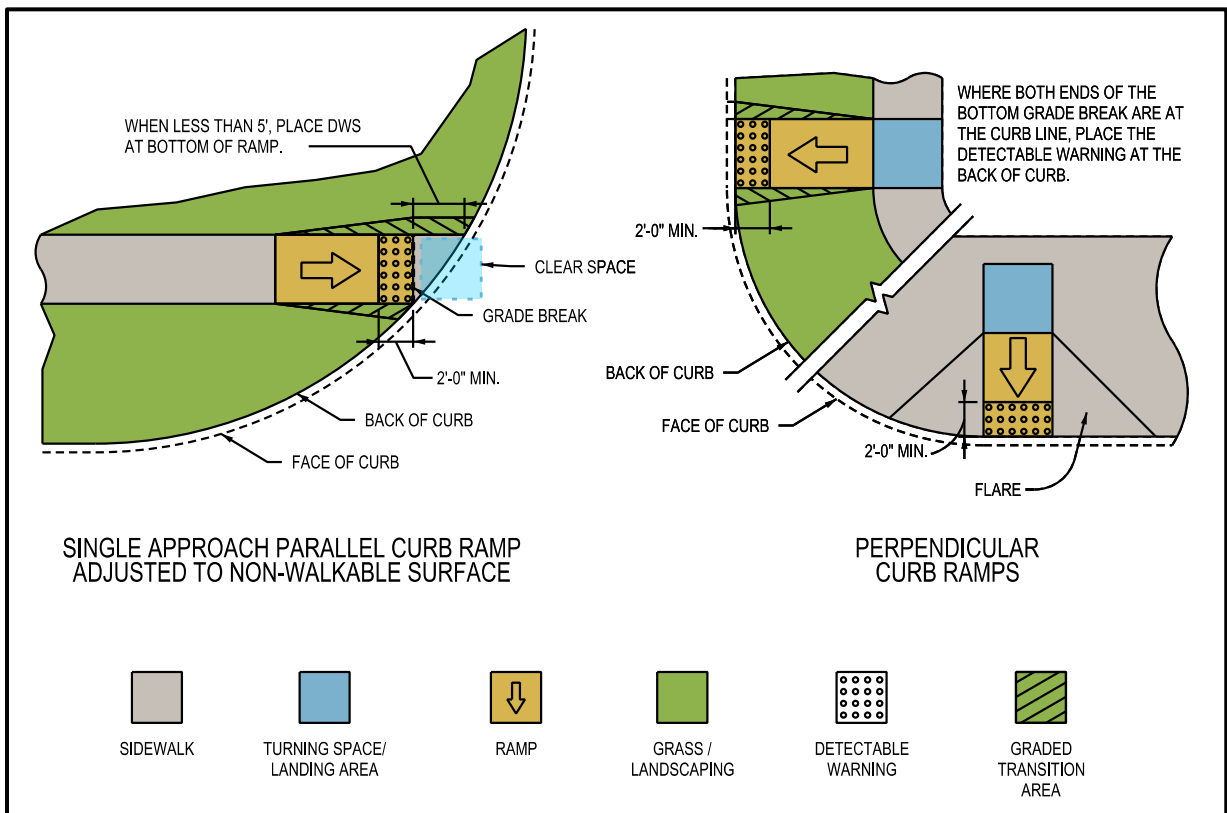
3.9.3 Placement of DWS at Curb Ramps

The DWS shall extend the full width of the curb ramp and fully depressed curb (excluding tapered curbs that form part of ramp side flares). The DWS shall extend at least 2 feet in length, measured in the direction of travel, from the back of the curb on the ramp surface. DWS are not permitted to be placed within the footprint of the depressed curb itself and must be installed behind the effective back of curb, including along tangent sections. DWS should be installed perpendicular to the path of pedestrian travel as described in Section 3.9.3.1, with DWS grid pattern oriented in-line or on alignment with the direction of pedestrian travel at street crossings, to provide smoother travel for wheelchair users and allow the wheels to “track” between the domes.

3.9.3.1 DWS for Perpendicular Curb Ramp on a Radius

For perpendicular curb ramp designs (and single approach parallel curb ramp designs) on a radius, install a grade break behind the curb with the leading edge of the DWS adjacent to the grade break and extend across the full width of ramp excluding any flared sides. One corner of the leading edge of the DWS shall be located at the back of curb. No other point along the leading edge of the DWS shall be more than 5 feet from the back of curb as shown in Figure 3.9.3.1 (unless an RPE is obtained for that DWS location).

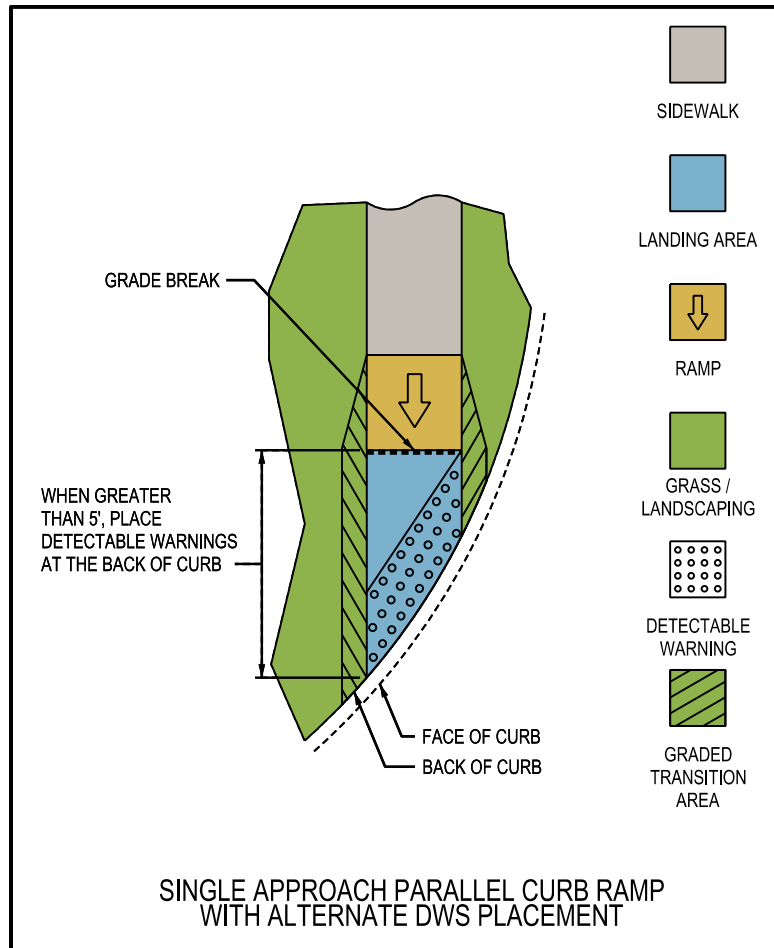
Figure 3.9.3.1 DWS on Parallel and Perpendicular Curb Ramps



3.9.3.2 DWS for a Parallel Ramp with a Buffer

For curb ramp designs where the leading edge of the DWS cannot be placed perpendicular to the direction of pedestrian travel without a portion of the leading edge falling more than 5 feet from the back of curb, refer to Figure 3.9.3.2 and follow parallel ramp example for DWS placement adjacent to the back of depressed curb and extend across the full width of ramp excluding ramp side flares.

Figure 3.9.3.2 DWS on Parallel Curb Ramp with Grass Buffer Area



3.9.3.3 DWS for a Parallel Ramp with no Buffer

For parallel curb ramp designs without a buffer, place DWS adjacent to the back of depressed curb and extend across the full width of turning space excluding ramp side flares. See Figure 3.9.3.3-a.

Figure 3.9.3.3-a DWS on Parallel Curb Ramp Without Buffer

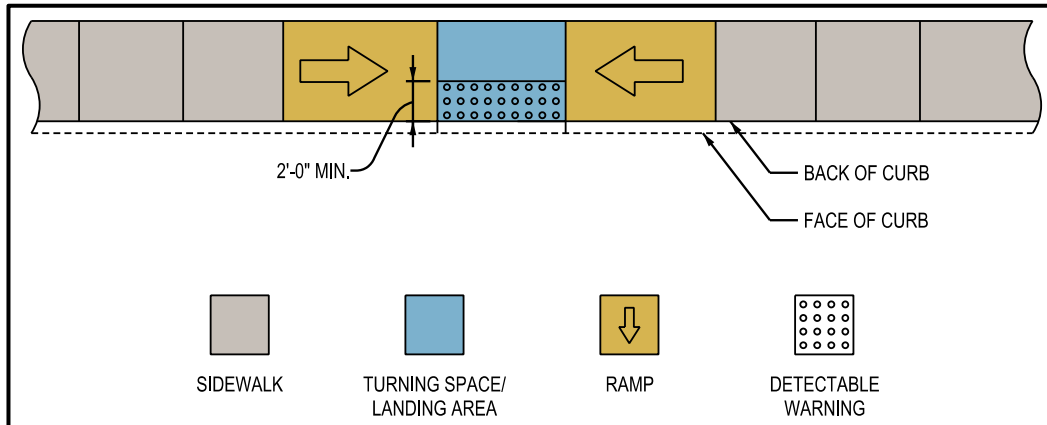
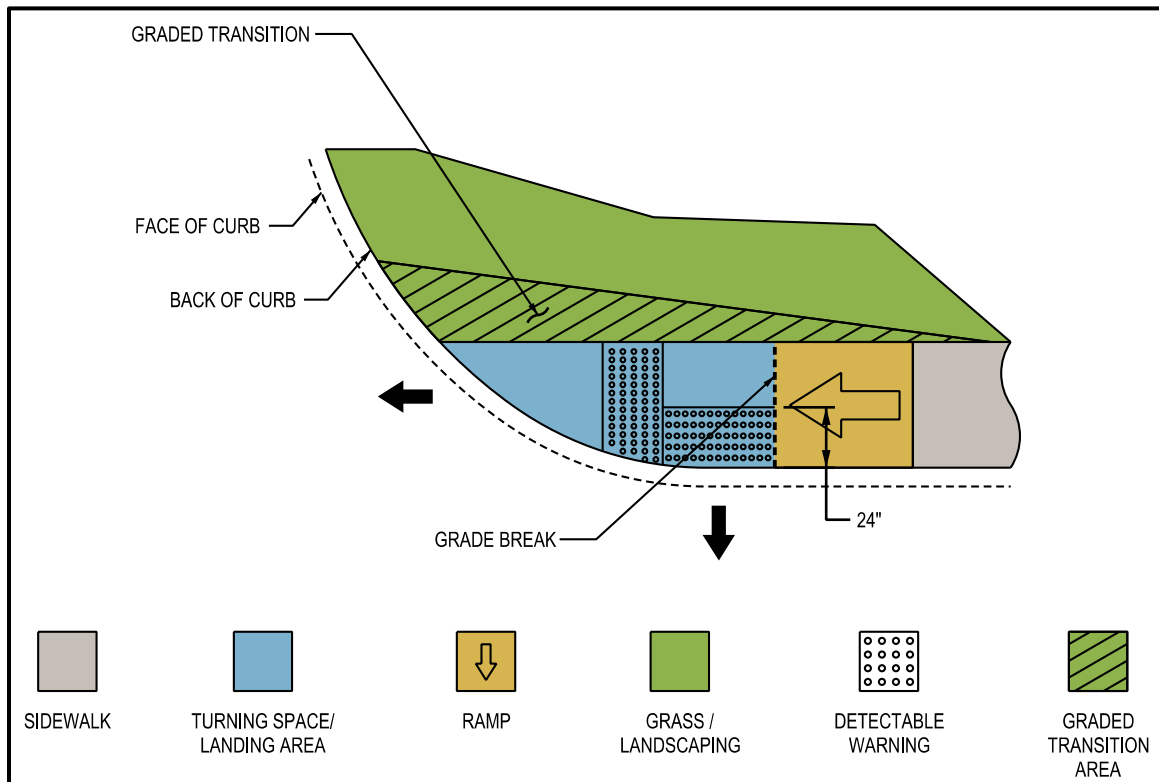


Figure 3.9.3.3-b illustrates an alternative curb ramp design which may only be used on 3R Projects for situations where the existing sidewalk is without a buffer, and there are two existing pedestrian crossings and no intersecting sidewalk from the side street. (Note: The DWS shown below is not aligned continuously with the back of curb along the radius in an effort to draw the PAR user's attention to the overlap of the parallel and perpendicular crossings.)

Figure 3.9.3.3-b Overlapping DWS Location on Radius and Tangent



3.9.4 Placement of DWS at Medians and Islands

DWS shall extend the full width of the crossing, matching the PAR approach width. DWS within medians or channelizing islands require 2 feet of separation, therefore DWS cannot be placed in median or island crossings if the total width is less than 6 feet from back of curb to back of curb. If signalized, then place DWS in the median only if the pedestrian crossing is in two phases with a pedestrian pushbutton in the median, since the DWS indicate to persons with visual impairments that they should stop before proceeding.

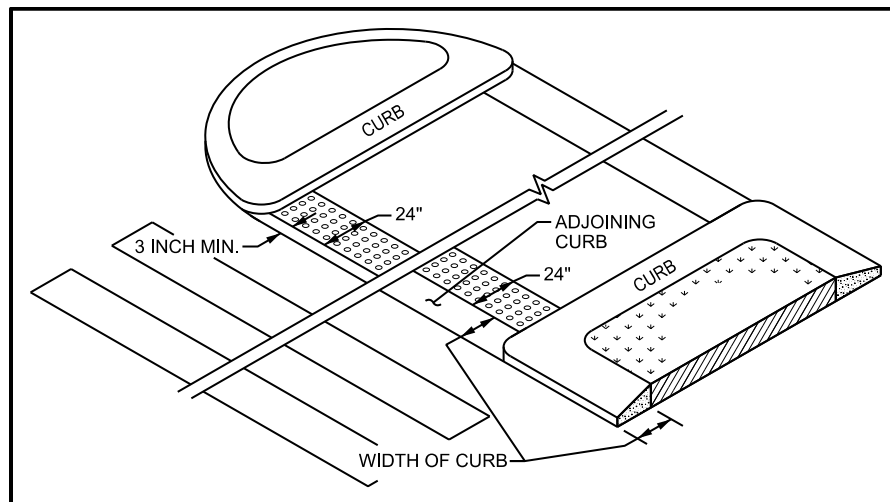
3.9.4.1 Median or Island with Depressed Curbs

DWS shall extend 2 feet minimum from the back of curb. See Section 3.9.3.2.

3.9.4.2 Median or Island without Depressed Curbs

DWS shall be placed at a distance from the paved edge of the adjacent roadways equal to the width of the adjoining curb or shall be placed a minimum 3 inches to provide buffer and mitigate danger of cracking from pavement rolling and compaction equipment. The two sections of DWS shall be separated by a section of smooth pavement that extends 2 feet or more in length, measured in the direction of travel. Place DWS offset from edge of pavement, extending 2 feet minimum in the direction of travel. See Figure 3.9.4.2 and DelDOT Standard Construction Details for additional guidance on layout options.

Figure 3.9.4.2 DWS Offset From Edge of Paving



3.9.5 DWS at Railroad Crossings

Where required and installed per this section, the DWS shall extend 2 feet in length, measured in the direction of pedestrian travel, and shall be installed across the full width of PAR at a rail crossing. The rows of truncated domes in the DWS should be aligned to be parallel with the direction of wheelchair travel. DWS installation relative to the railway varies by situation:

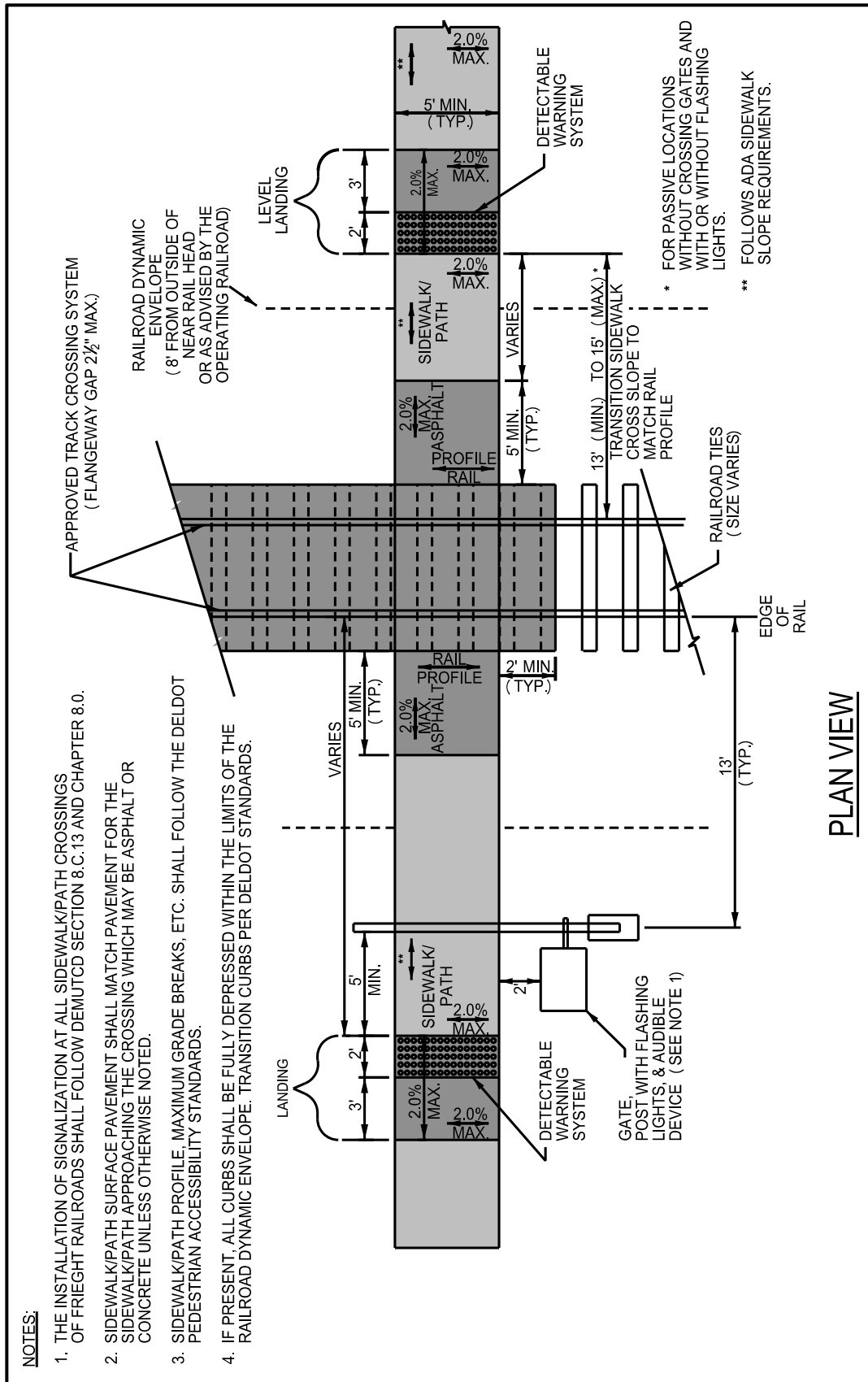
3.9.5.1 Railroad Tracks Cross the PAR (Without Gates):

Place DWS at least 13 feet but not more than 15 feet from the edge of the closest rail.

3.9.5.2 Railroad Tracks Cross the PAR (With Gates):

Place DWS at least 5 feet prior to the face of the crossing gate arm in the gate down position.

Figure 3.9.5 Pedestrian Railroad Crossing Detail



3.9.6 DWS at Commercial Driveways/Entrances

Required at the junction between the pedestrian route and the vehicular route for locations where traffic signals are present. Detectable warnings may also be installed in other areas when determined necessary by engineering judgment. Factors which present a potentially hazardous situation may also be considered, including entrances with characteristics similar to minor streets (e.g., speeds of 25 m.p.h. or greater and/or ADT greater than about 400), blind spots with limited line of sight or sight distance, complicated turning movements or other situations in which pedestrians with visual impairments should be signaled to stop. They should not be used at all entrances without consideration of the above criteria, since overuse can cause confusion for pedestrians with visual impairments. When used, the DWS shall extend the full width of the sidewalk or SUP and shall extend at least 2 feet in length, measured in the direction of travel, from the edge of the driveway or entrance.

3.9.7 DWS at Miscellaneous Crossings

Detectable warnings may also be installed in other areas when determined necessary by engineering judgment and approved by DelDOT's internal Project Manager. Situations that may warrant the installation of DWS include locations with inadequate sight distance for PAR users or oncoming vehicles, complicated turning movements where driver or PAR user decision making may be more challenging, and/or other constraints for which pedestrians with impaired vision should be signaled to stop. DWS should not be used at all entrances or alleys without consideration of the above criteria, since overuse of DWS can undermine the intended value of DWS for PAR users with impaired vision.

3.10 Crosswalks

As described in Section 3.5, the presence of pedestrian facility connections to a roadway at an intersection with a roadway implies that a crosswalk exists, whether it is marked or unmarked. Crosswalks at intersections, when marked, are done so primarily to guide pedestrians across the intersection and secondarily to warn approaching motorists of the potential for pedestrians to cross at that location. All marked crosswalks at a specific intersection should be designed and maintained using the same type of DE MUTCD compliant markings to provide a consistently marked path of travel in the ROW. Skewed crosswalks should be avoided, where practicable with respect to the project type and project scope.

Crosswalk guidelines that designers must consider are:

3.10.1 Width of Crosswalks

When marked, crosswalks shall be at least 6 feet wide (per DE MUTCD) or wider to ensure that the approach sidewalk, shared use path or trail can be aligned centrally within the crosswalk marking.

3.10.2 Cross Slope of Crosswalks at street level crossings

“Tabling” of intersections is not required. However, the designer shall make reasonable efforts to provide crosswalk cross slopes and pedestrian connection cross slopes (see Section 3.8.7.2 and Figure 3.10.2 which follows Section 3.10.2.3) as follows:

3.10.2.1 Without Stop or Yield Control (or with Traffic Signal)

At pedestrian street crossings that are uncontrolled, without stop or yield control signage (or where traffic control signals are provided):

- A. On New Construction projects and intersection Reconstruction projects, the designer should provide crosswalk cross slopes, where practicable, that are no greater than 20H:1V (5.0%).

- B. At intersections on 3R projects, and on Reconstruction projects that do not include vertical grade changes, the designer should strive to achieve a reasonable crosswalk cross slope, considering the scope of the project, the terrain, and physical constraints such as structures. Crosswalk cross slopes in excess of 20H:1V (5.0%) should be avoided where practicable.

3.10.2.2 With Stop or Yield Control (with Signage)

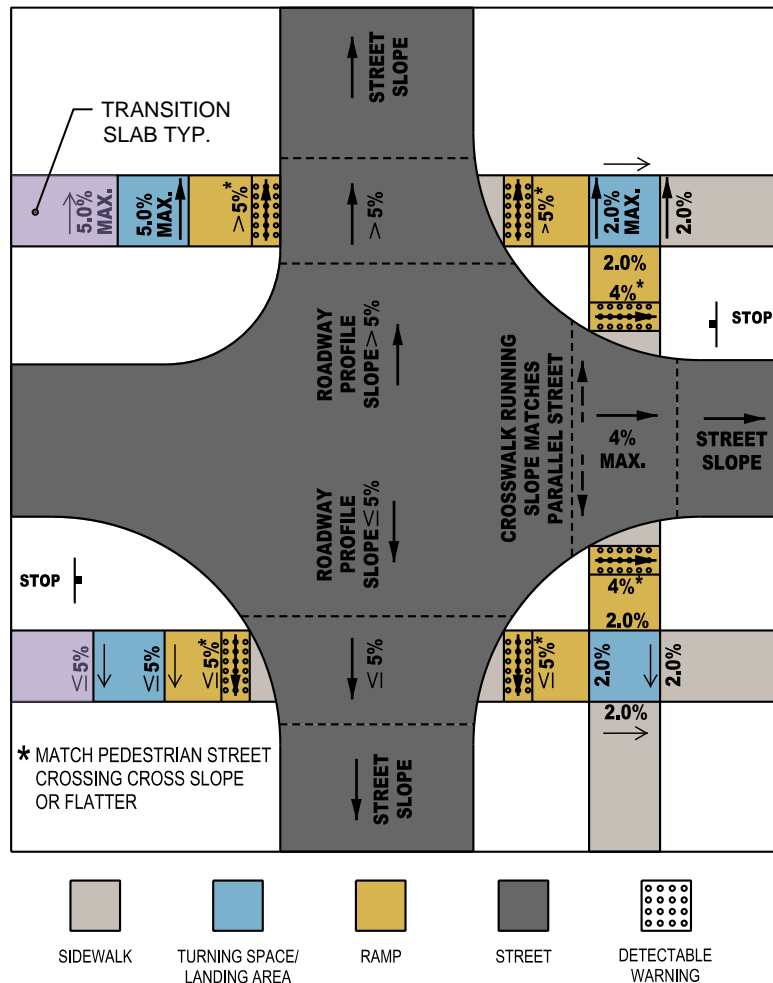
At pedestrian street crossings with stop or yield control signage (see DE MUTCD):

- A. On New Construction projects and intersection Reconstruction projects, the designer should provide a maximum crosswalk cross slope of 50H:1V (2.0%) where practicable.
- B. At intersections on 3R projects, and on Reconstruction projects that do not include vertical grade changes, the designer should strive to achieve a reasonable crosswalk cross slope, considering the scope of the project, the terrain, and physical constraints such as structures. Crosswalk cross slopes in excess of 5.0% should be avoided where practicable.

3.10.2.3 Mid-Block Crossings

On mid-block crossings, the crosswalk cross slope is permitted to be equal to the road profile slope of the street being crossed.

Figure 3.10.2 Existing Intersection, 3R Project – Acceptable Crosswalk and Pedestrian Connections



3.10.3 Running Slope of Crosswalks

Running slope of crosswalks for New and Reconstruction Projects (new intersection construction) is 20H:1V (5.0%) maximum in the direction of pedestrian travel or matching the road profile slope (longitudinal slope) of the nearby roadway that the crosswalk runs parallel with.

On superelevated roadways where the roadway cross slope exceeds 5.0%, the running slope of the crosswalk shall match the roadway's superelevated cross slope. For example, if a horizontal curve requires a superelevation rate of 6.0%, then designers should not lower the superelevation rate to 5.0% to meet the maximum 5.0% crosswalk running slope.

3R Projects shall meet the crosswalk running slope criteria to the maximum extent practicable.

3.10.4 Surface of Crosswalks

Crosswalks with aesthetic surface treatments, such as brick pavers or stamped concrete shall not create uneven surfaces or joint openings between adjacent elements that exceed the vertical surface discontinuity standards of Section 3.3.2 or exceed the horizontal gap standards of Section 3.3.3. Isolated vertical elevation differences between adjacent surfaces shall be beveled per Figure 3.3.2.

3.10.5 Striping and Signage of Crosswalks

Signage, striping and traffic control devices used at pedestrian crossings, such as: warning signs, crosswalks, and crosswalk lines shall be designed using the DE MUTCD current edition. Determining the appropriate method and location to provide for safety and accessibility of PAR users at street crossings, requires the use of engineering judgment, traffic engineering analysis and coordination with DelDOT's internal Project Manager. DelDOT's internal Project Manager will ensure that the design of pedestrian crossings with challenging constraints (including situations that cannot be addressed by the direct application of available existing guidance such as the DelDOT Standard Construction Details and DE MUTCD) are designed through coordination with DelDOT's Traffic Section, ADA Title II/Section 504 Coordinator and Pedestrian Coordinator.

3.11 Median or Channelized Island Crossings

A median or channelizing island that is designed to provide a pedestrian refuge area shall include a PAR area that is 5 feet wide (minimum) and extends a minimum of 4 feet (but generally 6 feet or more in length), along the direction of travel, measured from back of curb to back of curb or where uncurbed, edge of roadway to edge of roadway. The cross slope of the grade breaks adjacent to the roadway for a refuge area shall match the cross slope of the adjacent crosswalk where the DWS abuts the street crossing. The median or island crossing length must provide sufficient area for the required pedestrian refuge elements:

3.11.1 PAR Surface

Smooth, flat (planar) and continuous surface constructed of materials that are firm, stable and slip resistant are required for the full length of the crossing. The two sections of DWS shall be separated by a section of smooth pavement (per Section 3.9.4).

3.11.2 Cross Slope

DelDOT's standards for median or channelizing island cross slope criteria are the same as those established for Crosswalks (see Section 3.10.2). The designer should strive to achieve a

reasonable cross slope, considering the scope of the project, the terrain, and physical constraints such as structures. Cross slopes in excess of 5.0% should be avoided where practicable.

3.11.3 Running Slope

Running slope should be 20H:1V (5.0%) maximum unless creating a curb ramp design with a landing area or matching the roadway profile slope (along the parallel roadway alignment).

3.11.4 Alternative Design Constraints

Within medians or islands where the length of refuge is more than 4 feet but less than 6 feet measured in the direction of travel along the PAR, the crossing shall be at-grade and without DWS. Where the signal timing allows pedestrians sufficient time to cross the roadway within the corresponding vehicular signal phase (green phase), the nose of medians can be pushed back from the intersection (behind the typical crosswalk layout), to accommodate the effective radius of design vehicle turning movements.

3.11.5 Drainage and Elevation Constraints

Pedestrian crossings at raised medians and channelizing islands may be designed with a cut-through sidewalk that is flush with the adjoining roadways, consistent with Figure 3.11.5-a, or a ramped sidewalk, consistent with Figure 3.11.5-b. The running slope possible through a median or island crossing, and the style of the crossing depends on the width of the median and the ability to provide positive drainage. Both the cut-through and ramped styles of median and island crossings shall provide a minimum clear width of 5 feet for pedestrian travel (excluding curbs, expansion joints, and cheek-walls). If a median or island crossing is ramped, the slope of the ramps shall be no steeper than 12 H: 1V maximum (8.3%) and a turning space (or landing area) measuring 5 feet wide and 4 feet long (in the direction of pedestrian travel) is required between the ramps. Aside from the length, the turning space shall meet the requirements of section 3.8.7.7.

Figure 3.11.5-a Cut-Through Median

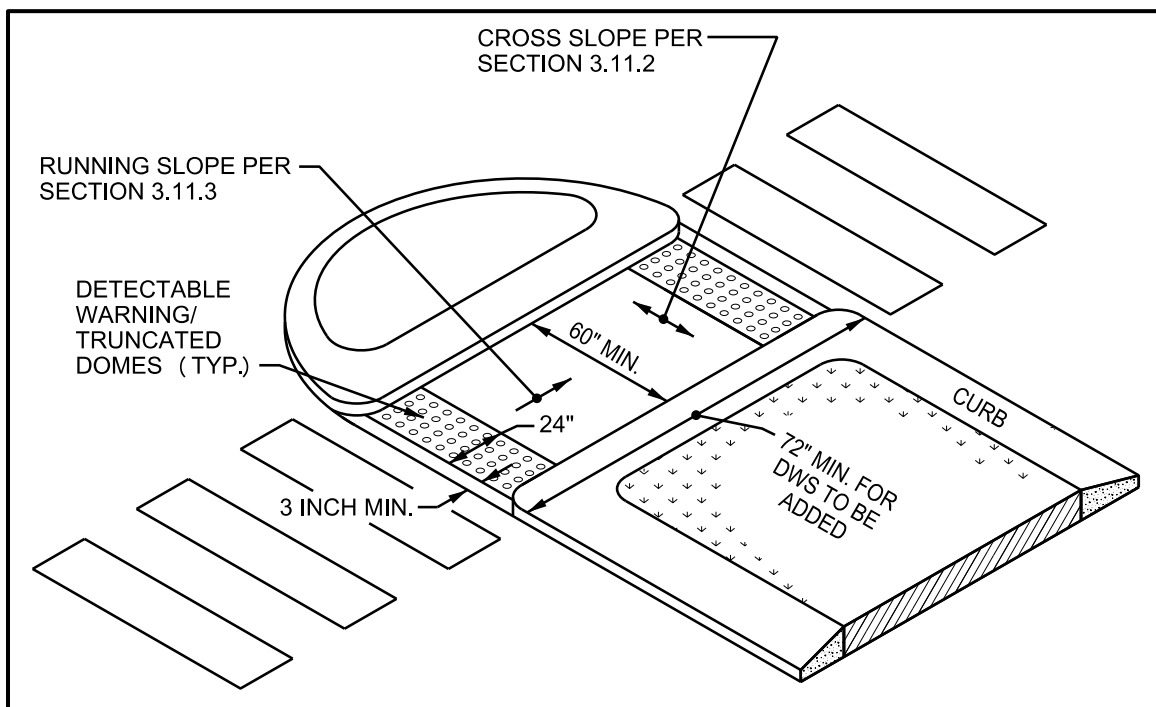
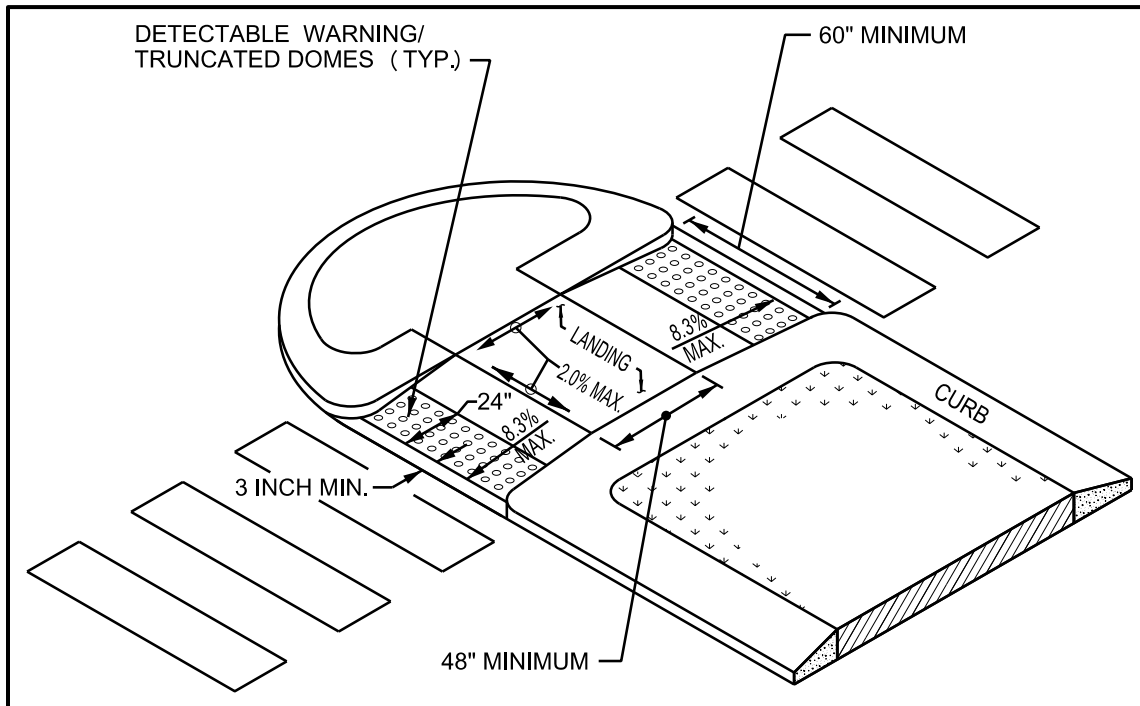


Figure 3.11.5-b Ramped Median



3.12 Roundabouts

Pedestrian street crossings at intersections with roundabouts can be difficult for persons with disabilities, particularly those with visual impairments, to identify and/or navigate because the vehicle movements differ from those typical of other intersections and the pedestrian crossings are located off to the side of the pedestrian circulation path that routes around the roadway. Where sidewalks are placed flush against the curb at roundabouts but pedestrian street crossings are not intended, a continuous and detectable edge treatment shall be provided along the street side of the sidewalk along roundabouts. DWS (truncated domes) such as those used at curb ramps are not an acceptable choice for this required edge treatment. Where chains, fencing, or railings are used for edge protection, visually contrasting materials with the bottom edge of the treatment no more than 15 inches above the sidewalk must be used to be detectable (including by cane) for a broad range of users. Additional guidance and best practices for detectable edge treatment at roundabouts are available, including NCHRP Report 674 *“Crossing Solutions at Roundabouts and Channelized Turn Lanes for Pedestrians with Vision Disabilities”*.

The continuous traffic flow at roundabouts removes or modifies many of the audible cues that pedestrians with visual impairments might normally use to navigate pedestrian street crossings. At multi-lane roundabouts with pedestrian street crossings, a pedestrian activated signal must be considered for each multilane segment of each pedestrian crossing, including at the splitter islands. Pedestrian hybrid beacons can be used at roundabouts as described in the DE MUTCD sections 4F.01 through 4F.03. Proposed multilane roundabouts must be discussed with DelDOT Traffic.

3.13 Railroad Crossings

Railroad crossings are hazardous in a variety of ways for all users including pedestrians and bicyclists. Perpendicular crossings are ideal for most users and limit entrapment issues for mobility devices and bicycles. Design consideration or limitations to achieving perpendicular alignment will need to be documented for skewed orientations. Pedestrian safety and accessibility at railroad crossings can be enhanced by addressing the following elements:

3.13.1 PAR Requirements at Rail Crossing

The vertical alignment of the PAR surface and the flangeway gaps (the area adjacent to the inside of each rail that accommodates the wheel flanges of a rail car) is subject to the following requirements:

3.13.1.1 PAR Surface

Surfaces shall be constructed to be planar, smooth, and continuous. PAR surfaces shall be constructed using approved materials that are firm, stable, and slip-resistant.

3.13.1.2 PAR Approach to Outer Edge of Rails

Surfaces shall be level and flush with the top of rail at the outer edges of the rails.

3.13.1.3 PAR Between the Rails

Surfaces shall be aligned with the top of rail.

3.13.1.4 Flangeway Gap

Non-freight rail: 2.5 inches maximum opening (span across gap).

Freight rail: 3.0 inches maximum opening (span across gap).

3.13.1.5 Surface Slopes (See figure 3.9.5)

3.14 Bus Stops (and Transit Stops)

Bus stops (and transit stops) are part of the required PAR which connects transit services to: streets, sidewalks, paths, or trails. In addition, each bus stop component must be accessible via a compliant PAR and provide adequate maneuvering room for mobility device users. DeIDOT requires that the design phase of projects addressing other pedestrian facility barriers or non-compliant features in the public ROW also include the identification of barriers that prevent access to bus stops.

3.14.1 Boarding and Alighting Area Criteria

Bus stop accessibility requirements include the design and construction of boarding and alighting areas (as shown in Figure 3.14.1 which follows Section 3.14.1.5) which meet the following criteria:

3.14.1.1 Clear Length

8 feet minimum measured perpendicular to the curb or edge of roadway.

3.14.1.2 Slope Along the Length

Perpendicular to the roadway, the slope of the bus stop boarding and alighting area shall not be steeper than 50H:1V (2.0%) maximum.

3.14.1.3 Clear Width

5 feet minimum measured parallel to the roadway; 8 feet minimum if the pad is in an isolated location not connected to other pedestrian facilities.

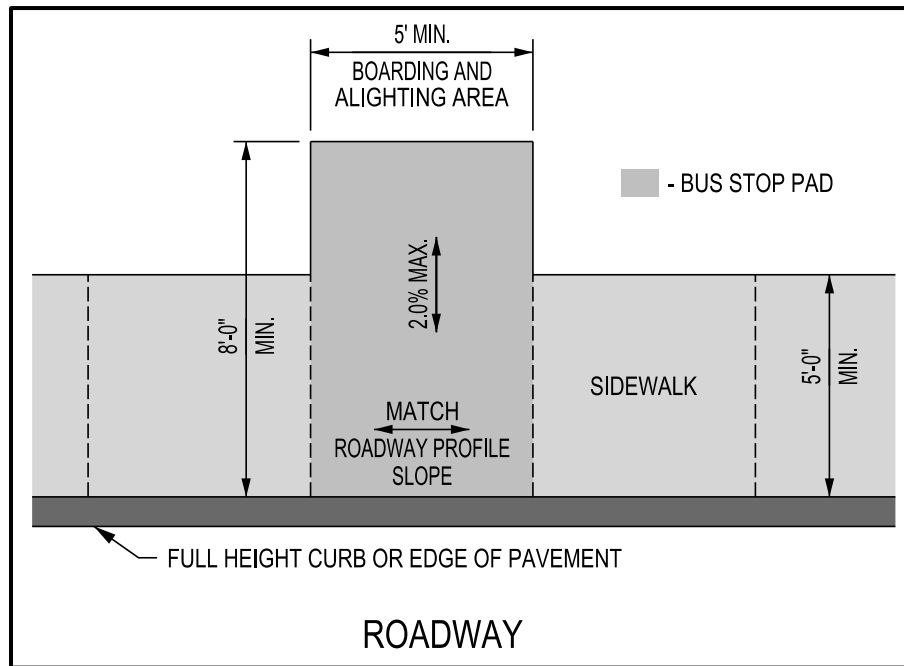
3.14.1.4 Slope Across the Width

Parallel to the roadway, the slope of the bus stop boarding and alighting area shall be the same as the roadway profile slope, to the maximum extent practicable.

3.14.1.5 Accessible Connections

Bus stops must be connected to bus shelters, streets, sidewalks, or pedestrian paths by a PAR.

Figure 3.14.1 Bus Boarding and Alighting Area



3.14.2 Practicability

If a required feature of a bus boarding and alighting pad cannot be designed or constructed to fully meet the above design standards, then the designer or inspector shall bring the non-compliant issue to the attention of DelDOT's internal section that has been assigned design or approval authority for the affected project. The design of the impacted feature shall be tailored to meet the above design standards to the maximum extent practicable. The designer or inspector shall then follow the documentation and RPE steps outlined in Chapter 4. The RPE process should be set in motion and involve DelDOT at the earliest point the deficiency is identified, as project approvals and acceptance may be delayed or jeopardized until RPE review and approval or denial are resolved.

3.14.3 New and Replacement Bus Shelters

Shelters shall be designed and installed (per US DOT 2006: 810.3 also see DelDOT's Standard Construction Details for more information) to provide someone using a wheelchair or mobility aid with the following:

3.14.3.1 Accessible via PAR

Access from the boarding and alighting area into the shelter.

3.14.3.2 Accessible Entry Point

Width of entry point that is not less than 36 inches minimum width.

3.14.3.3 Sheltered Waiting Area

Waiting area shall be provided and fit entirely within the shelter.

3.14.3.4 Clear Floor Space

A clear floor space at least 30 inches wide by 48 inches long shall be provided at each element with operable parts or informational content provided for users. The clear floor space may overlap the maneuvering space and clear floor area for other elements, if the full dimensions are unobstructed or meet knee and toe clearance, (where applicable).

3.15 Traffic Signals and Pedestrian Signals

Modifications to, or creation of, traffic signals and/or pedestrian signals must be coordinated and scoped through DelDOT's Traffic Studies and/or Traffic System Design Sections. DelDOT will require that a Traffic Justification Study be performed prior to design or installation of new signal equipment. The addition of crosswalks and pedestrian signal phases at traffic control signals typically requires a traffic engineering study of both pedestrian and vehicular traffic to determine crosswalk configurations.

Pedestrian signal installations at street crossings, including accessible pedestrian signals (APS) which incorporate audible and vibrotactile features, shall comply with requirements provided in the DE MUTCD.

3.15.1 Approval Process for APS Retrofit Requests

The "DelDOT Interim Guidelines for the Installation of Accessible Pedestrian Signals," dated December 11, 2007, provides designers with an understanding of the process that DelDOT uses to evaluate and prioritize APS installations (including High Intensity Activated Crosswalk - HAWK signals) when they are requested.

3.15.2 Pedestrian Push Button Placement Criteria

To ensure accessibility for pedestrians with disabilities, push buttons shall be located in accordance with the requirements of the DE MUTCD, (see DE MUTCD Figures 4E-3 and 4E-4 for more information).

3.16 On-Street Parking

Pedestrian accessibility for persons with disabilities frequently involves the use of passenger vehicles for trip making. As a result, the availability and location of accessible parking spaces relative to the location of work, shopping, recreation, or other social activities is a key component of trip making and pedestrian safety. On-street parking may only be provided and marked or metered with DelDOT's concurrence, (such as through an executed Town Agreement). Each accessible parking space that is provided within the ROW is required to be marked using signage and striping complying with the DE MUTCD.

3.16.1 Required On-Street Accessible Parking Space

Where on-street parking is created within the project limits and the parking is marked or

metered, accessible parking spaces shall be provided. The minimum required number of accessible parking spaces that must be provided within the project limits should be in accordance with Figure 3.16.1. Where parking pay stations are provided and the parking is not marked, each 20' where parking is permitted within the project limits shall be counted as one parking space.

Table 3.16.1 On-Street Parking Space Ratio

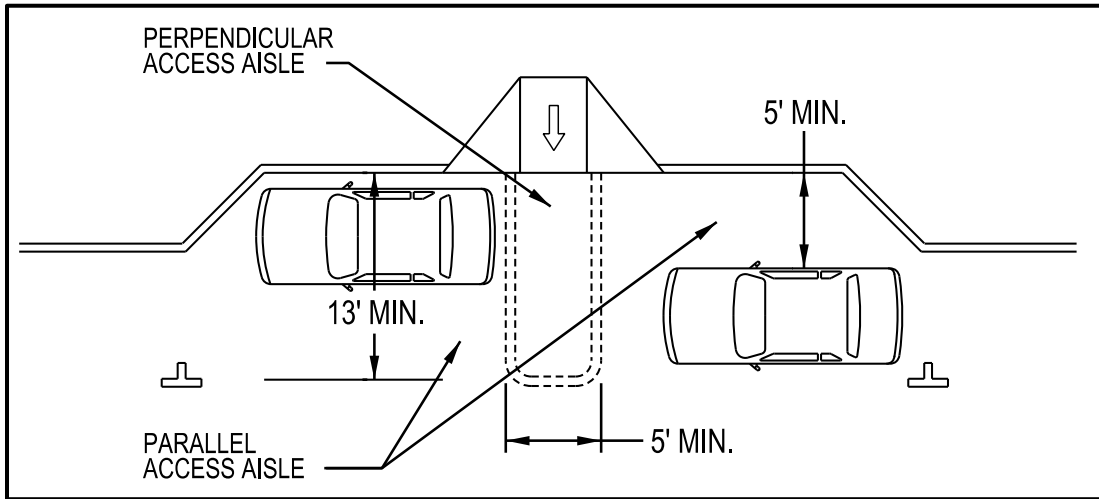
Total Number of Marked or Metered Parking Spaces Created Within the Project Limits	Minimum Required Number of Accessible Parking Spaces
1 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 and over	4.0% of total

When provided, accessible on-street parking spaces should be located close to known high use pedestrian generators and/or community centers. If possible, the spaces should be located where the roadway has a minimal roadway profile slope and cross slope to improve the feasibility of making the transition to a wheelchair. In addition, the adjoining sidewalk should be free of obstructions that would interfere with the deployment of a vehicle lift or ramp. The design of new accessible parking spaces and related PAR shall use compliant curb ramps connected directly to access aisles or boarding and alighting areas.

3.16.2 Parallel On-Street Accessible Parking Space

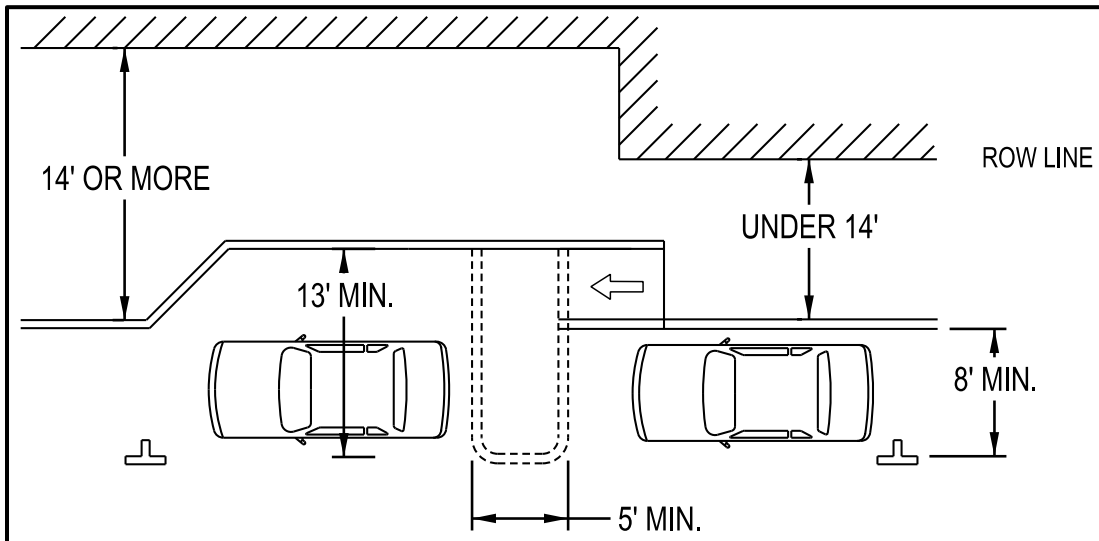
Parallel parking spaces may only be provided and marked within the ROW with DeIDOT's pre-approval. Where the width of the adjacent ROW behind the curb is greater than 14 feet, an access aisle at least 5 feet wide should be provided at street level the full length of the accessible parking space. (See Figure 3.16.2-a) If provided, the access aisle shall connect to a PAR serving the accessible parking space. The access aisle shall not encroach on the vehicular travel lane. An access aisle is not required where the width of the adjacent ROW behind the curb is less than or equal to 14 feet. (See Figure 3.16.2-b) When an access aisle is not provided, the parking space can be located at either end of the block to promote the ability to access the PAR by way of the curb ramp that serves the crosswalk adjacent to the accessible parking space located at the end of the block.

Figure 3.16.2-a Accessible Parallel Parking Spaces*



Note: *All pavement marking and signage must comply with the DE MUTCD

Figure 3.16.2-b Accessible Parallel Parking Spaces*



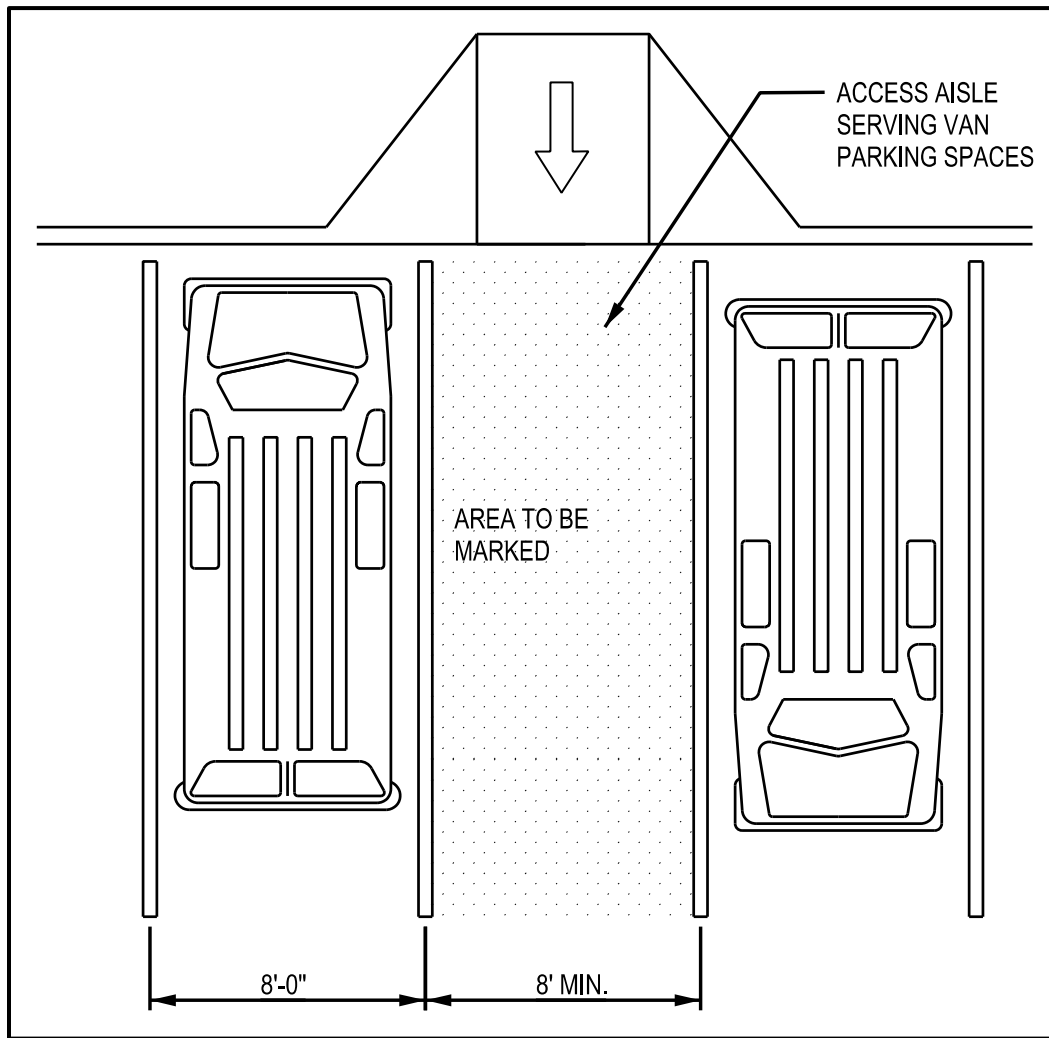
Note: *All pavement marking and signage must comply with the DE MUTCD

3.16.3 Perpendicular and Angled On-Street Accessible Parking Space

Perpendicular or angled parking spaces may only be provided and marked within the ROW with DeDOT's pre-approval. Where new perpendicular or angled parking is provided, an access aisle that has a minimum width of 96 inches measured perpendicularly from the parking space stripe shall be provided at street level the full length of the parking space. New access aisles shall connect to a PAR serving the accessible parking space. Access aisles shall be clearly

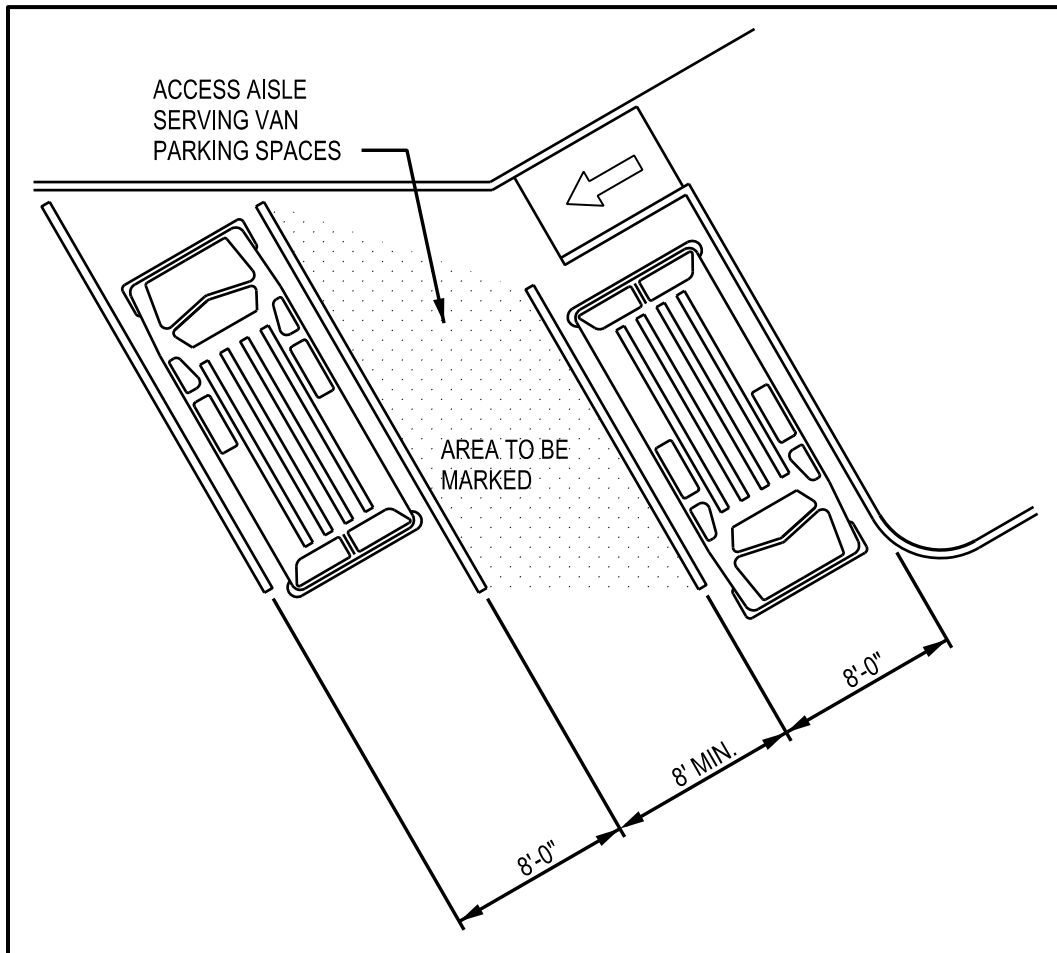
marked to help discourage parking in them. Accessible perpendicular and angled on-street parking is typically designed and treated as van parking with wide access aisles (See Figure 3.16.3-a & Figure 3.16.3-b). Two spaces are permitted to use a single access aisle except where local ordinance prohibits backing vehicles into perpendicular or angled parking spaces. In this instance, an access aisle for each accessible space would be necessary.

Figure 3.16.3-a Accessible Perpendicular Van Parking Spaces*



Note: *All pavement marking and signage must comply with the DE MUTCD

Figure 3.16.3-b Accessible Angled Van Parking Spaces*



Note: *All pavement marking and signage must comply with the DE MUTCD

3.16.4 Marking and Metering of On-Street Accessible Parking Space

Where provided within the ROW, each accessible parking space must be signed as such using the International Symbol of Accessibility complying with the requirements of the DE MUTCD. Signs shall be located at the head or foot of the parking space so as not to interfere with the operation of a side lift or a passenger side transfer.

Parking meters that are provided within the ROW and serve accessible parking spaces must be connected to the parking space and the meter by an accessible PAR. If the parking meters are provided at each space, they shall be located at the head or foot of the parking space so as not to interfere with the operation of a side lift or passenger side transfer maneuvers. Accessible parking meter designs shall incorporate displays and information that are visible from a point no higher than 39 inches above the center of the required clear space in front of the meter or pay station. Operable parts of new accessible parking meters shall comply with side reach or forward reach requirements, 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 not exceed 5 pounds of force.

3.17 Park and Ride Facilities and Other On-Site Parking Facilities

These facilities must comply with the US DOT 2006: Sections 208, 209, 502 and 503.

3.18 Curb Ramp Placement Guidelines and Examples

In considering all of the standards and design criteria provided by the PAS, designers must remain vigilant for actual conditions, (identified during design and/or construction), that will create variability in the standardization of locating curb ramps. Some general planning concepts are provided for designers to consider:

Accessibility is optimized by utilizing paired perpendicular ramps, (two ramps on each corner). While this is more easily accomplished on intersections of smaller radius, designers should seek to apply this approach more broadly. Large diagonal ramps can mislead pedestrians with visual impairments and increase their length of travel.

Often a minimum radius in urban areas is 35'. Given a 35' radius, 10' crosswalk and 4' offset to stop bar, the pedestrian ramp will likely end up on the radius. If the ramp is on the radius, and must be perpendicular to the curb line, (to limit the challenges experienced by persons with disabilities that are using mobility aids), then the ramp will be skewed relative to the crosswalk. For traffic operations and sight distance for right turning vehicles, stop bars and crosswalks are often placed closer to the intersecting street, forcing the crosswalk into the radius.

On some skewed intersections, paired perpendicular ramps may be the best solution for one corner, while an alternative design resembling a diagonal curb ramp may be a better fit for an opposing corner.

3.18.1 Guidance for Selection of Pedestrian Street Level Connections

In planning for the type of pedestrian street level connections to be used at a particular location, Table 3.18.1 provides some general guidance on which combinations of sidewalk widths, corner radii and curb ramp types may work together most effectively to achieve Desired Standards and maintain accessibility for the broadest cross-section of users, including persons with disabilities.

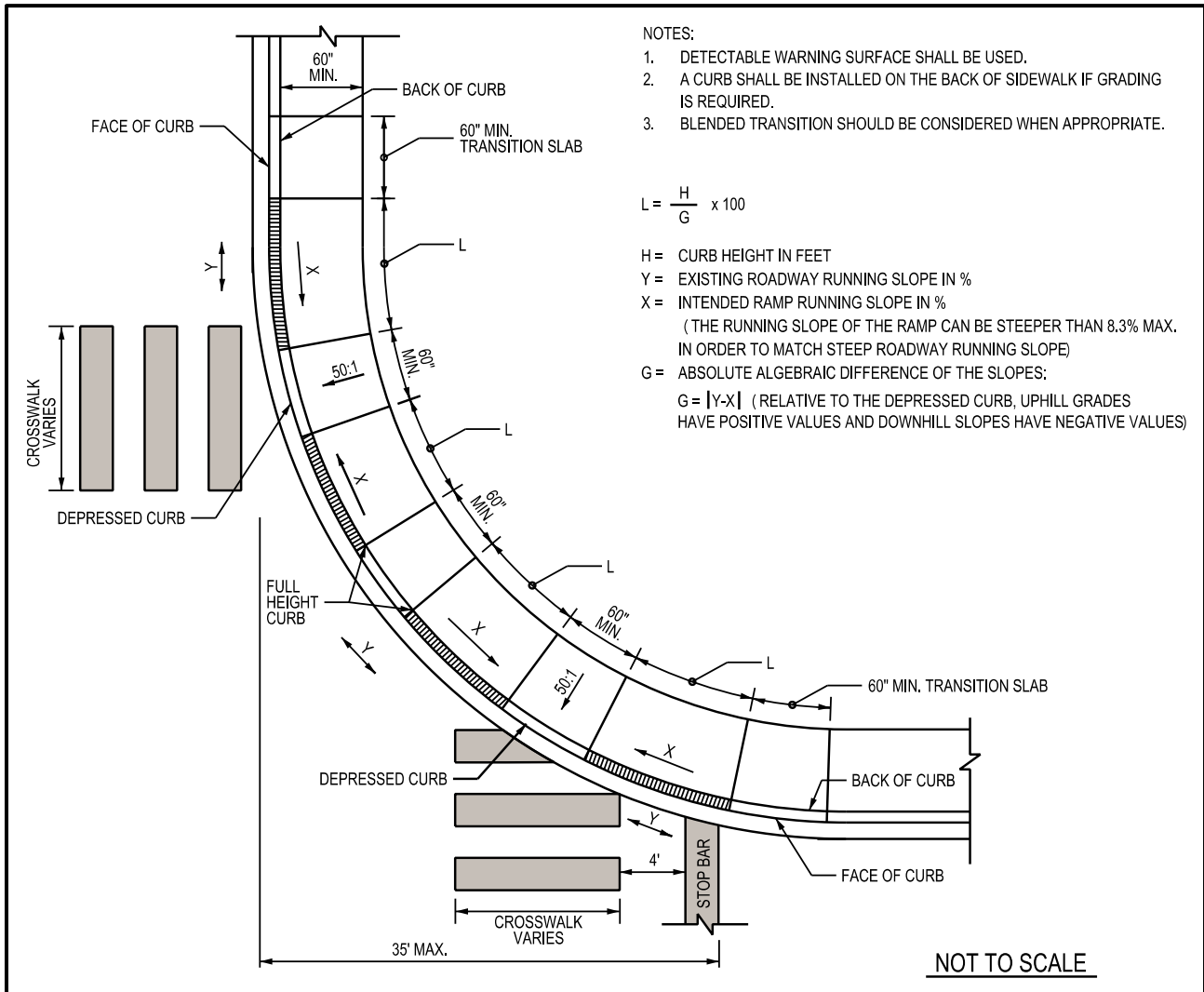
Table 3.18.1 Guidance for Selection of Pedestrian Connection Types

	Perpen- dicular	Parallel	Perpendicular Parallel Combination	Diagonal (Not Preferred)
SW - 8' and less from curb to back of walk		X		
SW - 8' to 12' from curb to back of walk		X	X	
SW - 12' and more from curb to back of walk	X	X	X	X
Small Radius (20' and Less)	X	X	X	
Large Radius (25' and Greater)		X		X
Islands	X		X	

3.18.2 Sample Curb Ramp Solutions

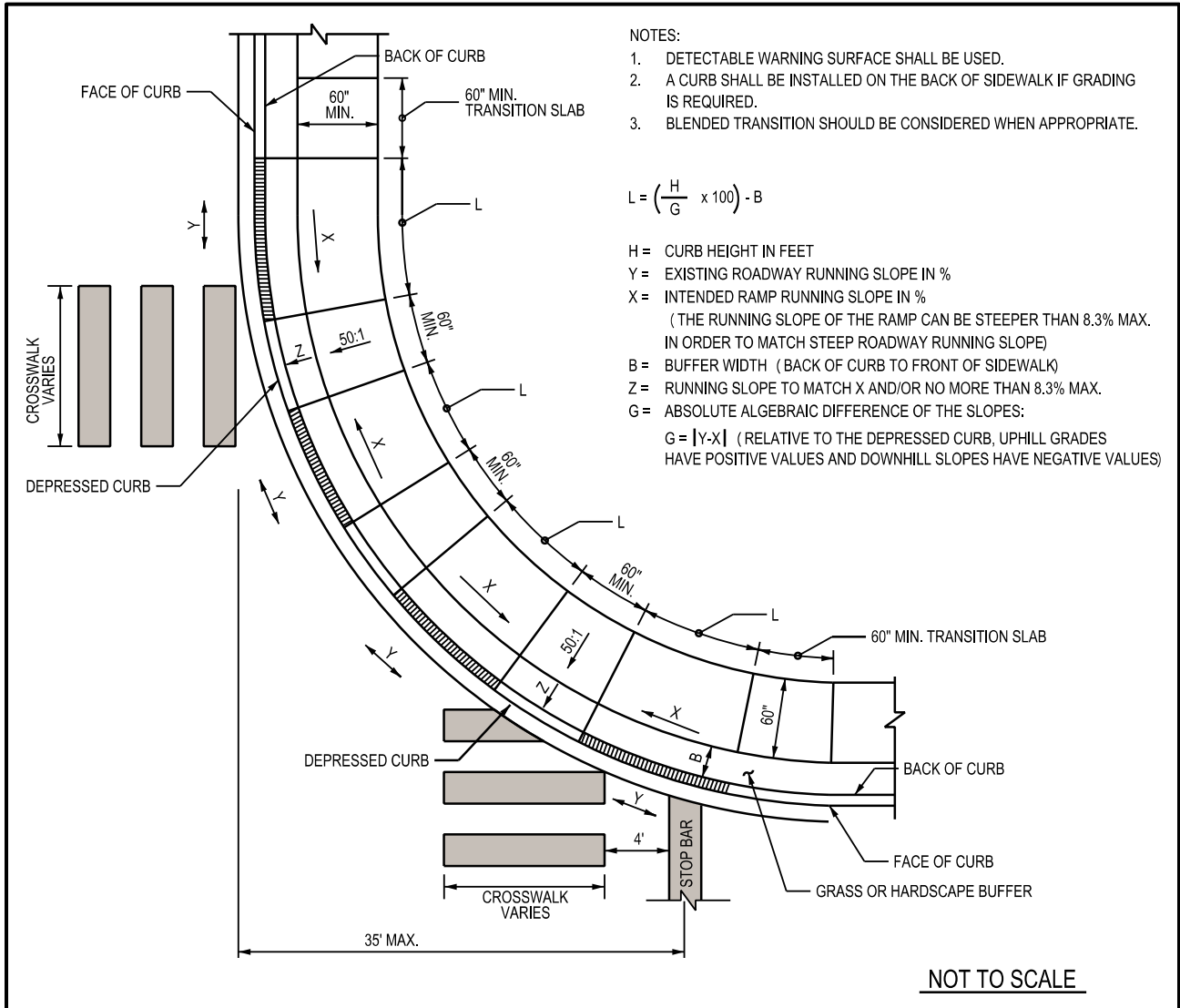
Examples provided below are not intended to be inclusive of all possible situations but are representative of some of the more typical situations.

Figure 3.18.2-a Sample Curb Ramp – Paired Parallel with 35-foot Radius



Application of this detail is suited to urban or suburban intersections with large curb radii and narrow sidewalks. It does not allow for pedestrians to enter an intersection (or crosswalk) at a right angle. Use of this detail is most appropriate at signalized intersections, since the setback of the ramp from the crossing roadway requires that the stop bar be installed farther back than is desirable for operational safety concerns at a stop-controlled intersection.

Figure 3.18.2-b Sample Curb Ramp – Paired Combination with 35-foot or Larger Radius



Application of this detail is suited to urban or suburban intersections with large curb radii and sidewalks that are 8 feet or more in width. It does not allow for pedestrians to enter an intersection (or crosswalk) at a right angle. Use of this detail is most appropriate at signalized intersections, since the setback of the ramp from the crossing roadway requires that the stop bar be installed farther back than is desirable for operational safety concerns at a stop-controlled intersection.

4.0 Request for Practical Exceptions

4.1 Background

This Chapter describes the forms or processes used to ensure that designers, contractors, and inspectors use a reasonable and consistent approach in the identification, review and documentation of pedestrian accessibility issues and decisions that do not meet the Minimum Standards established in Chapter 3 for accessibility requirements and PAR features.

Practical Exceptions to the Minimum Standards may be considered when physical constraints, public safety, or operational issues make compliance with Minimum Standards impractical. When Minimum Standards will not be met, a Request for Practical Exception (RPE) must be submitted for approval.

The RPE form is available online at <https://www.deldot.gov/Publications/manuals/pedestrianAccessibility/pdfs/2018/RequestforPracticalExceptionformAppendixA.pdf> under “*Manuals*”: “*Pedestrian Accessibility Standards for Facilities in the Public ROW*”; “*Appendix A – Request for Practical Exception Form*” . The approval process of the RPE will occur internal to DelDOT and involves a range of personnel such as the ADA Title II/Section 504 Coordinator, the Assistant Director of the Section overseeing the design and/or approval of the project, and/or the Chief Engineer. RPE documentation must demonstrate that appropriate improvements were designed and constructed using sound engineering judgment at a given location, and that those improvements are consistent with other similar decisions made concerning accessibility compliance in the ROW. The Practical Exception approval process requires the responsible internal DelDOT Project Manager to retain documentation of the constraints that prevent the design and/or construction of pedestrian system features that meet or exceed the Minimum PAR Standards.

4.1.1 Conditions to be Considered Prior to Submitting an RPE

An RPE should not be submitted until all reasonable alternatives to provide convenient, continuous, and accessible pedestrian accommodations have been exhausted using sound engineering judgment. An RPE must reflect consideration of the following constraints:

- A.** Pedestrian and Vehicular Safety
- B.** Roadway profile (longitudinal) slope
- C.** Right-of-way limitations
- D.** Existing utilities
- E.** Existing buildings, walls, and/or underground vaults
- F.** Historic features and historic property impacts
- G.** Environmental or cultural impacts
- H.** Existing and proposed conditions for land use and transportation facilities

4.1.2 Additional Considerations When Preparing an RPE

Location of a facility within an historic district by itself does not excuse compliance with the requirements in this document. The State Historic Preservation Officer or Advisory Council on Historic Preservation must determine that compliance would threaten or destroy historically significant features of the facility. Where the State Historic Preservation Officer determines

that compliance with a requirement would threaten or destroy historically significant features of a qualified historic facility, compliance shall be required to the extent that it does not threaten or destroy historically significant features of the facility.

Community opposition to providing the required degree of accessibility compliance will not be adequate grounds to approve an RPE.

In 3R and Maintenance Projects, where the path of pedestrian travel in the ROW is limited by a practical exception or other constraints, an accessible path for travel onto private property beyond the scope and limits of the project is not required. An RPE must document efforts made to meet full accessibility compliance to the maximum extent practicable within the ROW across the scope and limits of the project. Design and/or construction of projects that create a negative impact by creating a barrier to access or decreasing (or having the effect of decreasing) the pedestrian accessibility of a facility or an accessible connection to an adjacent building or site are prohibited.

The RPE process is not intended to eliminate the requirements for accommodating persons with disabilities. The goal is to ensure that the design and construction of all PAR elements within the ROW are compliant with Desired Standards to the maximum extent practicable and to ensure that adequate documentation is provided where the Minimum Standards cannot be met. An RPE is not needed if DeIDOT Traffic concurs with a justifiable request that pedestrian access should be prohibited using DE MUTCD complaint signage at a specific leg of an intersection.

An RPE must document the constraints encountered and the alternative approach selected to achieve an optimized degree of accessibility for the affected PAR element. Each RPE must result in the design and construction of PAR features that account for pedestrian route safety, convenience, and continuity to the maximum extent practicable within the constraints of the project's available ROW and project limits. RPE approvals will not be granted as blanket approvals on a project-wide or program-wide basis.

4.2 Approval Process

The RPE process is intended to be undertaken during the early stages of design, (but can also be implemented during final design, construction, or inspection), when initial identification occurs of a pedestrian system feature or similar group of pedestrian system features that cannot be designed or constructed to meet the Minimum Standards. Identification of these features can be made by DeIDOT staff, DeIDOT consultants or third parties associated with the project, and must be escalated to the attention of the internal DeIDOT Project Manager in the DeIDOT section that is responsible for the design approval or construction acceptance of the Project. The internal DeIDOT Project Manager has the responsibility to evaluate alternative solutions and designs that could meet the PAR Minimum Standards to the maximum extent practicable and/or provide equivalent access to navigate around the features that cannot achieve full compliance. If those efforts are adequately documented as unsuccessful, only then will DeIDOT consider granting an RPE approval.

If the Minimum Standards cannot be met, the RPE must be prepared using the published forms available <https://www.deldot.gov/Publications/manuals/pedestrianAccessibility/pdfs/2018/RequestforPracticalExceptionformAppendixA.pdf> on-line at <https://www.deldot.gov/Publications/manuals/pedestrianAccessibility/pdfs/2018/RequestforPracticalExceptionformAppendixA.pdf>, under "*Manuals*": "*Pedestrian Accessibility Standards for Facilities in the Public ROW*"; "*Appendix A – Request for Practical Exception Form*" and

clearly but briefly demonstrate and document the constraints encountered, and the decision-making process followed to establish the purpose and need for the PAR features in question. The RPE documentation must provide an overview and evaluation of the alternatives considered as part of the effort to meet the Minimum Standards to the maximum extent practicable. The completed RPE will be submitted for the concurrence of the Assistant Director of the Section responsible for design approval or construction acceptance, and the ADA Title II/Section 504 Coordinator. The RPE review and concurrence responsibilities of the ADA Title II/Section 504 Coordinator include ensuring that the requested improvement is procedurally defensible and that it acceptably accommodates the intended purpose and accessibility of the identified PAR features. The responsibilities of the applicable Assistant Director, include ensuring that reasonable alternatives, (meeting the intended purpose of the identified PAR features), were evaluated and that relevant requirements and guidelines were properly addressed, (using a balanced approach with respect to pedestrian and vehicular safety, accessibility, and operational needs). This RPE coordination must be conducted in a consistent and methodical fashion to help ensure that the proposed improvement will be made compliant to the maximum extent practicable with respect to the PAR design standards and within the context of the existing constraints that were encountered.

Following review and concurrence by the Assistant Director and the ADA Title II/Section 504 Coordinator, the Assistant Director will forward the RPE to the Chief Engineer for final approval. However, should agreement not be reached between the Assistant Director and the ADA Title II/Section 504 Coordinator, the Chief Engineer can provide a final ruling on the RPE. DelDOT will only permit a project in design to proceed to advertisement or construction if the project provides accessibility compliance with the Minimum Standards or has been granted an approved Practical Exception for specific pedestrian system features on the project. Similarly, DelDOT will only permit a project in construction to proceed to final acceptance if the project provides accessibility compliance with the Minimum Standards or has been granted an approved Practical Exception for specific pedestrian system features that were identified as non-compliant during construction and/or inspection.

During construction and maintenance operations, the internal DelDOT Project Manager may conduct the RPE coordination, recommendations and approval process by telephone, e-mail and other verbal or written communications methods to avoid delays in providing the needed accessible pedestrian system features. The written RPE submission must be processed for the concurrence of the Assistant Director and ADA Title II/Section 504 Coordinator as soon as possible, but not later than 10 business days following the verbal approval. Following written concurrence, the Assistant Director must then submit the RPE to the Chief Engineer for approval.

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