

CHAPTER 6 ACCESSIBILITY

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Adopted: 06/23/2020

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6.1 OVERVIEW

This chapter addresses the standards and technical criteria to be used to plan, design, construct, choose materials for, locate, repair, maintain, reconstruct, and use accessible pedestrian facilities within and adjacent to public roadways, whether such pedestrian facilities are located within the public right-of-way, easements, or tracts, and on Shared Use Paths.

Design criteria and requirements presented in this chapter shall apply to pedestrian facilities within and adjacent to public roadways, whether such pedestrian facilities are located within right-of-way, easements, or tracts, and whether such public roadways are dedicated to use by the public or in fact used by the general public, regardless of the entity responsible for operation and maintenance. Other pedestrian facilities outside of the public right-of-way or easements or tracts adjacent thereto may be required, however, to comply with ADA Standards and requirements based on other codes and regulations.

All pedestrian facilities shall be designed and constructed in accordance with current Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG), including the Shared Use Paths Supplement.

This chapter provides key design criteria for ADA Compliance. All new construction and alterations shall adhere to all PROWAG criteria to the maximum extent feasible. All new construction and alterations shall meet the requirements of this chapter unless a deviation request detailing the specific existing site constraints and technical infeasibility is approved by the ECM Administrator. Traditional maintenance activities that do not affect the public's access to or usability of the roadway are not required to comply with requirements of this chapter.

6.1.1 Purpose

The purpose of this chapter is to provide detailed design guidelines and criteria relating to accessibility for the preparation of plans for and access to all roadways dedicated to use by the public or in fact used by the general public, regardless of the entity responsible for operation and maintenance. These facilities include sidewalks, curb ramps, street crossings, and other elements within and adjacent to public roadways.

6.1.2 Chapter Content and References

Table 6-1 outlines the chapter content and references used as a basis for the standards established in Chapter 6.

Table 6-1. Contents and Basis of Accessibility Standards

Intent Use	ECM Content	ECM Section(s)	Reference Document(s)
Design			
	Sidewalks	6.3.1	1, 8
	Pedestrian Street Crossings	6.3.2	1
	Curb Ramps/Blended Transitions	6.3.3	1, 9
	Detectable Warning Surfaces	6.3.4	1, 9
	Medians/Pedestrian Refuge Islands	6.3.5	1
	Pedestrian Signals/Pushbuttons	6.3.6	1, 3, 4, 9
	Shared Use Paths	6.3.7	1, 2, 3, 4, 7
	Transit Stops	6.3.8	1
	Pedestrian Over/Underpasses	6.3.9	1
	Ancillary Elements	6.3.10	1, 3, 4, 8
	Pedestrian Access in Work Zones	6.3.11	1, 3, 4, 9
Construction			
	Inspections	Ch. 5, 6.4, App. J	1, 3, 4
	Acceptance	Ch. 5, 6.4	1, 3, 4

References

1. United States Access Board, Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG), 2011
2. United States Access Board, Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way; Shared Use Paths Supplement, 2013
3. FHWA, Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), 2009 with Revisions 1 and 2, 2012
4. CDOT, Supplement to the Federal Manual on Uniform Traffic Control Devices, 2009
5. United States Department of Justice, 2010 ADA Standards for Accessible Design (ADA Standards), 2010
6. United States Department of Justice, Americans With Disabilities Act Title II Regulations (ADA Regulations), 2010
7. AASHTO, AASHTO Guide for the Development of Bicycle Facilities, 2012
8. AASHTO, AASHTO Roadside Design Guide, 4th Edition, 2011
9. CDOT, M&S Standards
10. CDOT, Roadway Design Guide, 2018

6.1.3 Standard Drawings

Table 6-2 identifies the standard drawings that are included in Appendix F as an enforceable part of these Standards. The Standard Drawings shall be used when designing improvements for County-owned and maintained facilities. Any change to a Standard Drawing shall be approved by the ECM Administrator and noted in the construction plans. CDOT standard drawings adopted in the ECM are also applicable to the design of pedestrian facilities. Where noted in this chapter, El Paso County standard drawings supersede CDOT standard drawings.

Table 6-2. Standard Drawings

File Name	Detail/Description	Approval Date
SD_2-1	Urban Local Roadway (low volume)	6/23/2020
SD_2-2	Urban Local Roadway	6/23/2020
SD_2-3	Urban NonResidential Collector Roadway	6/23/2020
SD_2-4	Urban Residential Collector Roadway	6/23/2020
SD_2-5	Urban Minor Arterial Roadway	6/23/2020
SD_2-6	Urban Principal 4-Lane Arterial Roadway	6/23/2020
SD_2-7	Urban Principal 6-Lane Arterial Roadway	6/23/2020
SD_2-8	Urban Expressway 4-Lane Roadway	6/23/2020
SD_2-9	Urban Expressway 6-Lane Roadway	6/23/2020
SD_2-20	Typical Curb and Gutter Details	6/23/2020
SD-2-24	Driveway Detail w/ Attached Sidewalk	6/23/2020
SD_2-25	Driveway Detail w/ Detached Sidewalk	6/23/2020
SD_2-40	Pedestrian Curb Ramp Detail	6/23/2020
SD_2-41	Pedestrian Curb Ramp Detail	6/23/2020
SD_2-42	Detectable Warning Surface Details	6/23/2020
SD_2-50	Parallel Pedestrian Curb Ramp Detail	6/23/2020

6.1.4 Relationship between ECM, ADA, and PROWAG

The Americans with Disabilities Act (ADA) of 1990 is the civil rights law that prohibits discrimination against individuals with disabilities and is the basis for creating accessibility in the private and state and local government sectors. It is often referred to as the ADA Regulations. The ADA Standards establish the design requirements for the construction and alteration of facilities, including sites and buildings. Although they are related and based on similar concepts, these standards are not directly applicable to the public rights-of-way. In order to address elements within and adjacent to public roadways, the United States Access Board created the Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG). These guidelines establish the design requirements for construction and alteration of elements within and adjacent to public roadways. The United States Access Board has also created a supplement to PROWAG to address specific design requirements for Shared Use Paths.

El Paso County requires that all pedestrian facilities within and adjacent to public roadways be designed and constructed in accordance with current PROWAG requirements, including the Shared Use Paths Supplement. The design criteria and requirements presented in this chapter are taken directly from PROWAG.

Recommendations and best practices are provided to facilitate compliance during design and construction. Where additional guidance is required beyond what is presented in the ECM, refer to the ADA Regulations, 2010 ADA Standards, PROWAG (2011) with Shared Use Path Supplement (2013), MUTCD (2009 with revisions and Colorado Supplement), and other guidance and resources provided by the United States Access Board.

6.2 PLANNING AND APPLICABILITY

6.2.1 Definitions & Building Blocks of Accessible Design

A. Definitions

Pedestrian Circulation Path: A prepared exterior or interior surface provided for pedestrian travel within or adjacent to public roadways. The Pedestrian Circulation Path does not have to be accessible; however, the Pedestrian Access Route contained within the Pedestrian Circulation Path shall be accessible to those with disabilities.

Pedestrian Access Route: A continuous and unobstructed path of travel provided for pedestrians with disabilities within or coinciding with a Pedestrian Circulation Path. The Pedestrian Access Route shall comply with PROWAG.

Alteration: A change to a facility within or adjacent to public roadways that affects or could affect pedestrian access, circulation, or use. Alterations include, but are not limited to, resurfacing, rehabilitation, reconstruction, historic restoration, or changes or rearrangement of structural parts or elements of a facility. Many modifications to traffic signals are also considered alterations. See Section 6.3.6.

Maximum Extent Feasible: Where existing physical constraints make it impracticable for altered elements, spaces, or facilities to fully comply with the requirements for new construction, compliance is required to the extent practicable within the scope of the project. Also referred to as “Maximum Extent Practicable”.

Technically Infeasible: With respect to an alteration of a facility within or adjacent to public roadways, something that has little likelihood of being accomplished because existing physical or site constraints prohibit modification or addition of elements, spaces, or features that are in full and strict compliance with minimum requirements.

B. Construction Tolerances

The requirements and guidance provided in this chapter recognize the conventional tolerances associated with construction within or adjacent to public roadways. In accordance with PROWAG R103, “Dimensions are subject to conventional industry tolerances except where dimensions are stated as a range” and “Conventional industry tolerances include tolerances for field conditions and tolerances that may be a necessary consequence of a particular manufacturing process. Conventional industry tolerances do not apply to design work.”

6.2.2 Accessibility for New Construction

All new construction projects, where pedestrian access is included, shall be accessible and compliant with the Engineering Criteria Manual.

6.2.3 Accessibility for Alteration Projects

Whenever existing facilities are altered, they shall meet accessibility requirements within the scope and limits of the project as determined by the ECM Administrator. Alterations include projects such as reconstruction, rehabilitation, resurfacing, widening, and projects of similar scope and scale. For example, if a project requires resurfacing of an intersection, then the curb ramps and sidewalks within the project limits shall be updated to comply with the requirements contained in the ECM.

A. Transitional Segments

Transitional segments of Pedestrian Access Routes shall connect to existing unaltered segments of Pedestrian Circulation Paths and shall comply with Section 6.3.1 to the maximum extent practicable.

B. Reduction in Access Prohibited

An alteration shall not decrease or have the effect of decreasing the accessibility of a facility or an accessible connection to an adjacent building or site below the requirements for new construction in effect at the time of the alteration.

C. Technical Infeasibility

In alterations, it can be infeasible to make facilities fully compliant with the requirements of the ECM due to existing site constraints. Improvements at certain locations may be deemed "Technically Infeasible" when engineering judgement is used and the County concurs. If full compliance with the ECM is deemed technically infeasible, facilities being altered shall be made accessible to the maximum extent practicable. If full compliance cannot be achieved, a deviation request shall be made to the County in accordance with ECM Section 1.9 and Section 5.8. In the Deviation Request and Decision Form, the designer should fully and specifically document the existing site constraints that result in technical infeasibility and the efforts made to comply to the maximum extent practicable.

Examples of site constraints that may make it technically infeasible to make a facility fully compliant include:

- Underground structures or utilities that would need to be altered to make a facility compliant and would expand the project scope.
- Adjacent development or buildings that would need to be moved or altered to make a facility fully compliant.
- Required improvements that would alter the status of a Historic property.
- Drainage that could not be maintained if an area is made fully accessible.
- Underlying terrain that would require significant expansion of the project scope to achieve full compliance. An example would be altering an existing roadway profile to make the cross slope of a crosswalk fully compliant.

Project scope, not cost, shall determine when existing constraints make it technically infeasible to make a facility accessible. For example, if a roadway resurfacing project that does not include utility relocations would require relocating underground utilities to make a curb ramp accessible, then making the curb ramp fully accessible could be considered technically infeasible. If, however, a project requires relocation of utilities and widening of a roadway, then that same curb ramp should be made fully accessible.

D. Projects Solely to Improve Accessibility

If the sole purpose of a project is to improve accessibility, the scope of the project is not required to be expanded to make other adjacent portions of the Pedestrian Access Route and/or Pedestrian Circulation Path accessible. For example, a project whose sole purpose is to repair and replace sidewalk in poor condition would not be required to be expanded to fix adjacent noncompliant curb ramps. In these cases, documentation of the sole purpose to improve accessibility shall be documented during project development and written approval obtained from the ECM Administrator.

6.2.4 Accessibility for Maintenance Projects

Traditional maintenance activities do not require that the adjacent pedestrian facilities be made accessible. These activities include crack sealing, graveling, chip sealing, cover coating, pavement patching, restriping, and similar activities meant to seal and protect the road surface and improve friction and that do not significantly affect the public's access to or usability of the road.

6.3 ACCESSIBLE DESIGN

6.3.1 Sidewalks (Pedestrian Access Routes/Pedestrian Circulation Paths)

A. General Requirements

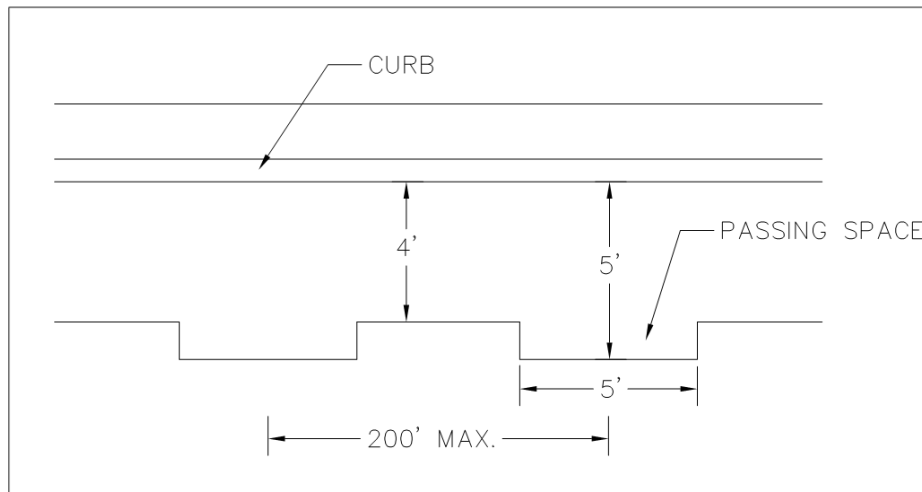
Accessible sidewalks provide a safe route and continuous path for users with disabilities. All new sidewalk and sidewalk that is being replaced as part of an alteration project shall comply with the requirements contained within this section. Pedestrian Access Routes shall be provided within Pedestrian Circulation Paths to connect with accessible elements, spaces, and facilities within and adjacent to public roadways.

B. Clear Width

Minimum-required sidewalk widths by roadway classification are specified in Table 2-4 through Table 2-7 and Appendix F. The minimum clear width of accessible sidewalk is 4 feet in all cases, excluding the width of the curb. If the designer chooses to use a 4 ft. wide sidewalk, then 5 ft. x 5 ft. passing spaces are required to be included and spaced a maximum of every 200 feet, as shown in **Figure 6-1**. Utilizing a 5 ft. wide (or wider) sidewalk eliminates the need for passing spaces. When sidewalk wider than the minimum 4 ft. width is provided (for example in an urban commercial area), only part of the sidewalk area is classified as the Pedestrian Access Route and must comply with the requirements of Section 6.3.1. Providing at least

the minimum width accessible Pedestrian Access Route ensures that persons with disabilities can access all accessible elements, spaces, and features along the roadway. If approved by the ECM Administrator, the remainder (classified as Pedestrian Circulation Path) may have street furniture, utility poles, etc. that would not be acceptable in the Pedestrian Access Route. Designers shall ensure that, where approved by the ECM Administrator, street furniture and other elements in the Pedestrian Circulation Path are detectable and will not present a hazard to pedestrians. All protruding objects within the Pedestrian Circulation Path shall meet the requirements of Section 6.3.1.F.6. Where feasible, designers are also encouraged to comply with slope and other requirements to improve the accessibility of the sidewalk area.

Figure 6-1. Passing Spaces



C. Vertical Alignment

The vertical alignment of all elements within a Pedestrian Access Route (sidewalks, curb ramps, blended transitions, turning spaces, and gutter areas, etc.) shall be planar. Grade breaks shall be flush.

D. Grade

The grade of Pedestrian Access Routes within and adjacent to public roadways shall not exceed 5%. When, however, the grade of the adjacent street is greater than 5%, the grade of adjacent Pedestrian Access Routes shall not exceed the general grade of the adjacent street or highway. In these cases, the Pedestrian Access Route is not considered a ramp even though its grade exceeds 5%. In all other areas, Pedestrian Access Routes with grades between 5% and 8.3% must comply with the requirements of Section 6.3.1.G.

E. Cross slope

The cross slope of all sidewalk contained within the Pedestrian Access Route shall not exceed 2%. Typical sidewalk cross slope of 1.5% is recommended for design to allow for construction tolerance.

F. Surface

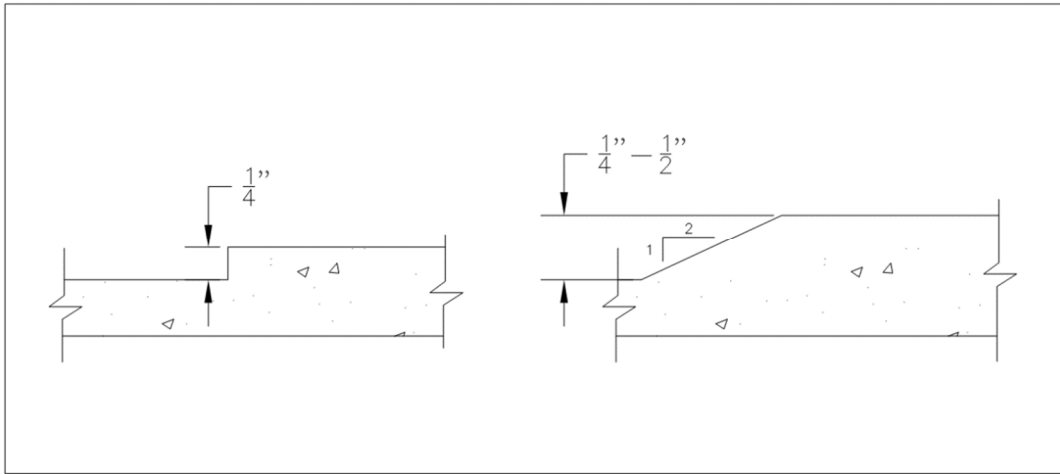
1. General

The surface of all elements contained within the Pedestrian Access Route shall be firm, stable, and slip resistant (e.g. concrete sidewalk with broom finish or slip-resistant plate over a drainage chase). Soft loose surfaces such as sand, gravel, or cobblestones can make it difficult for people using wheelchairs to move with ease.

2. Level Change

The maximum level change for a non-beveled surface is 0.25 inches. The maximum level change for a beveled surface is 0.50 inches. The beveled surface shall have a slope not steeper than 50% (2:1 H:V). See **Figure 6-2**.

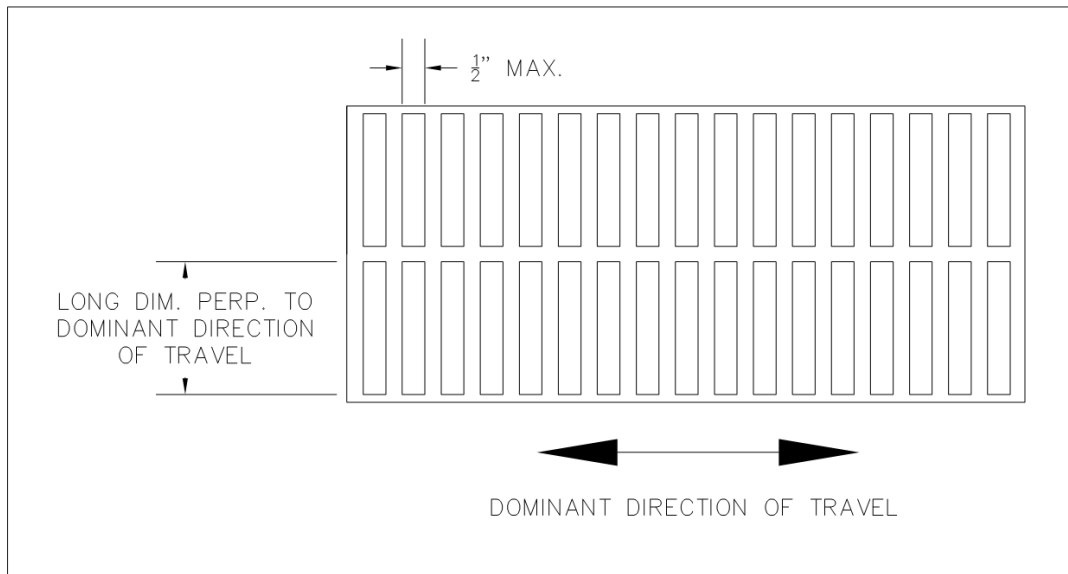
Figure 6-2. Vertical Surface Discontinuities



3. Horizontal Opening (Grates & Joints)

The maximum horizontal openings in gratings and joints shall not permit passage of a 0.50-inch diameter sphere. Elongated openings in grating shall be oriented such that the long dimension is perpendicular to the main direction of travel. See **Figure 6-3**.

Figure 6-3. Horizontal Openings



4. Surface Obstructions

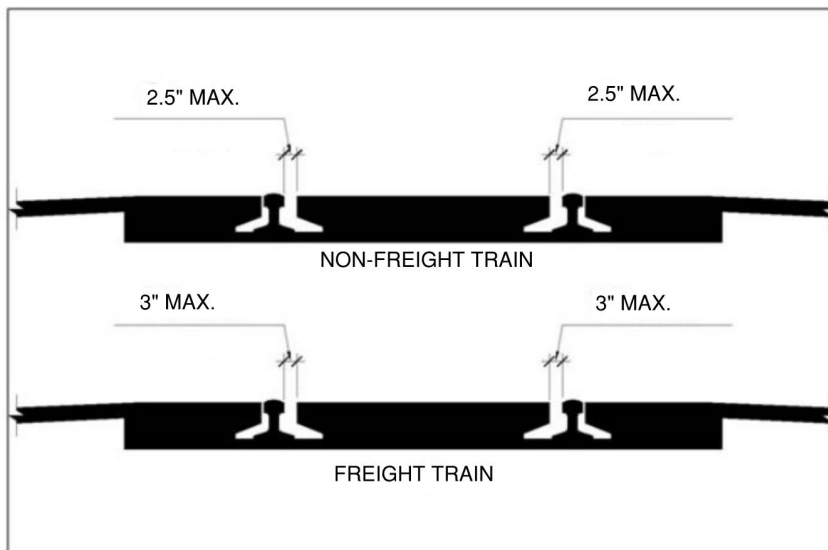
Utility vaults, covers, frames, and other elements should be located outside of Pedestrian Access Routes, curb ramps, and turning spaces whenever possible. Over time, differential settlement at these interfaces can lead to vertical discontinuities.

5. Railroad Crossings

Railroad crossings shall be level with the top of rail.

- The flangeway gap for a non-freight train rail shall not exceed 2.5 inches. See **Figure 6-4**.
- The flangeway gap for a freight train rail shall not exceed 3 inches. See **Figure 6-4**.

Figure 6-4. Flangeway Gaps

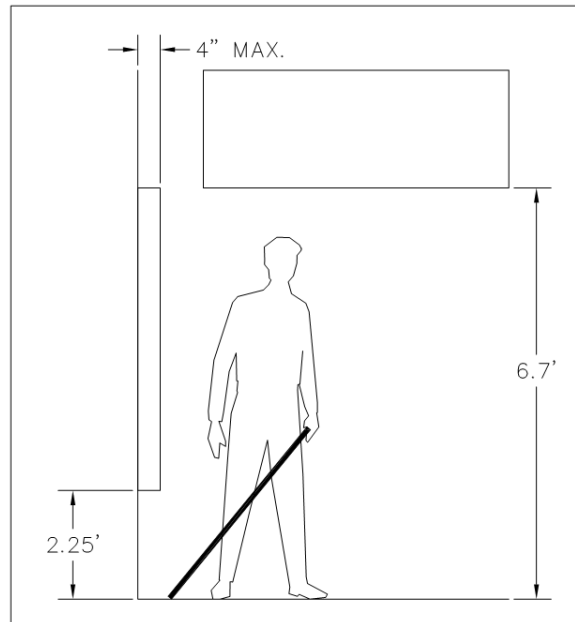


6. Protruding Objects

Roadside objects shall not be permitted to encroach upon or protrude into pedestrian routes including Pedestrian Access Routes and Pedestrian Circulation Paths. In cases where it is infeasible to locate objects outside of these pedestrian routes, a deviation must be approved by the ECM Administrator and these objects must be designed to be detectable and not present a hazard to pedestrians or vehicles. Objects include, but are not limited to, signs, street furniture, landscaping, and above ground utility poles and boxes. See Section 2.5.2.B.8 and Figure 2-35 for horizontal and vertical clearance requirements.

- **General:** Requirements for protruding objects extend along the entire width of the Pedestrian Circulation Path. Protruding objects shall not decrease the minimum required clear width of the Pedestrian Access Route.
- **Protrusion Limits:** Objects with leading edges more than 2.25 ft. and not more than 6.7 ft. above the finished surface shall not protrude more than 4 inches maximum into the Pedestrian Circulation Path. See **Figure 6-5**.

Figure 6-5. Protrusion Limits

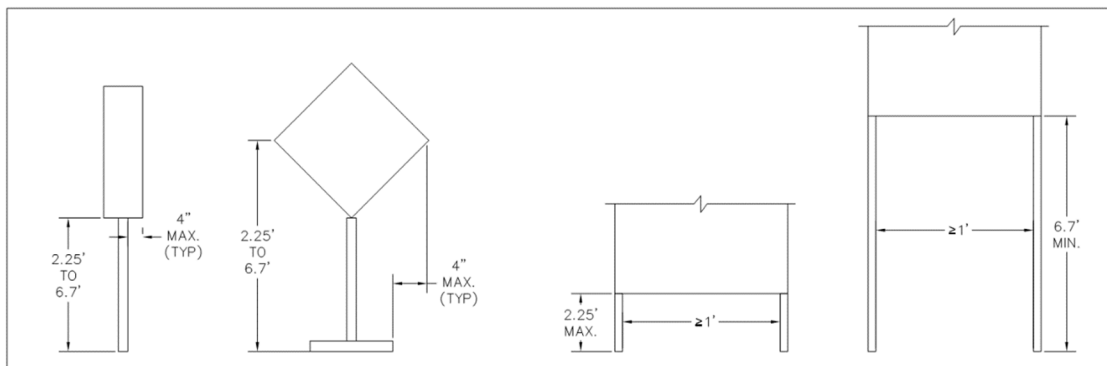


- **Post-Mounted Objects:**

When objects are mounted on free-standing posts or pylons and the object is between 2.25 ft. and 6.7 ft. above the finished surface, the maximum protrusion into the Pedestrian Circulation Path is 4 in., measured horizontally from the outside edge of the post or pylon.

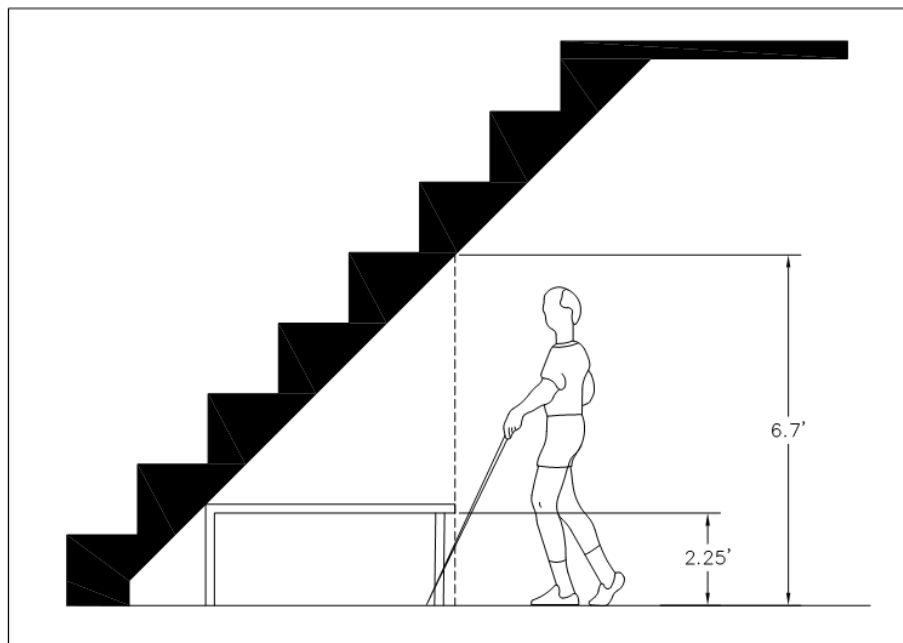
Where objects are mounted between 2 or more posts or pylons and the clear distance between the posts is 1 ft. or greater, the lowest edge of the object shall be 2.25 ft. maximum or 6.7 ft. minimum above the finished grade. See **Figure 6-6**.

Figure 6-6. Protrusion Limits for Post-Mounted Objects



- **Reduced Vertical Clearance:**
Railing or other barriers to pedestrian travel shall be provided where the vertical clearance is less than 6.7 ft. high. The leading edge of the railing or barrier shall be located 2.25 ft. maximum above the finished surface. See **Figure 6-7**.

Figure 6-7. Reduced Vertical Clearance



G. Ramps

Ramps (not to be confused with curb ramps) include Ramp Runs and Landings. See **Figure 6-8**. Ramps are required where the running slope of the sidewalk within a Pedestrian Access Route exceeds 5%.

1. Running Slope

The running slope of ramp runs is between 5% and 8.3%. Utilize the flattest slope feasible on ramp runs. A suggested maximum running slope of 7.5% is recommended for design to allow for variability during construction, since no construction tolerance is allowed.

2. Cross slope

The cross slope of ramps within the Pedestrian Access Route shall not exceed 2%. Typical ramp cross slope of 1.5% is recommended for design to allow for construction tolerance.

3. Clear Width

The minimum clear width of ramps is 4 ft. if handrails are not provided. If handrails are provided, the minimum clear width of ramps between handrails is 3 ft.

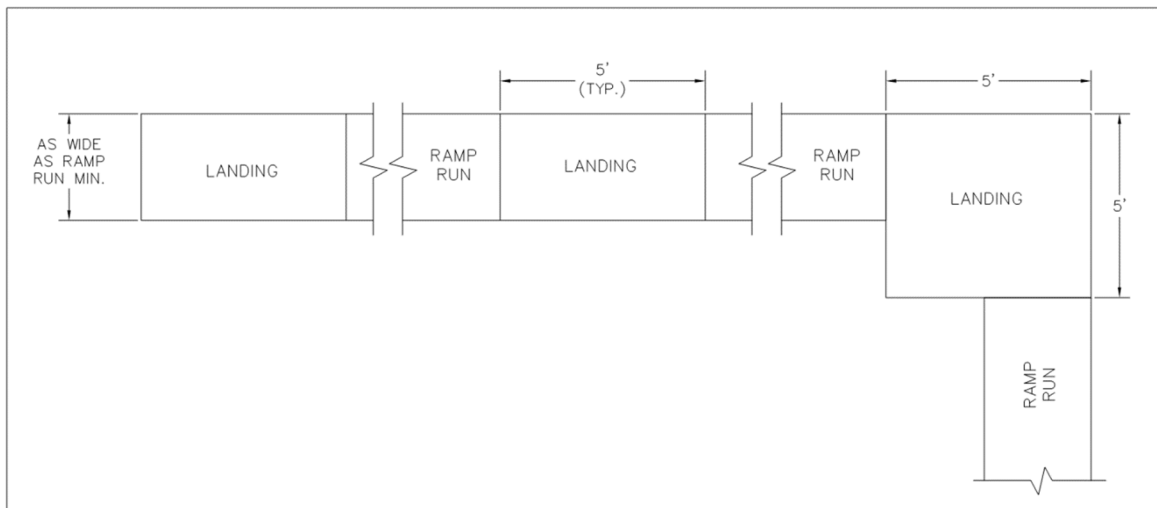
4. Rise

The maximum rise of a ramp run is limited to 2.5 ft. There is no limit to the number of consecutive ramp runs a Pedestrian Access Route may have, as long as intermediate landings are provided.

5. Landings

Landings shall be provided at the top and bottom of every ramp run, and intermediate landings shall be provided for every 2.5 ft. of ramp rise. The slope of the landing in any direction shall not exceed 2%. It is recommended that the slopes of the landing be designed with a 1.5% slope to allow for construction tolerance. The clear width of the landing shall be at least as wide as the ramp run leading to the landing. The length of the landing shall be 5 ft. minimum. For ramps that change direction between runs, landings shall have minimum dimensions of 5 ft. x 5 ft. See **Figure 6-8**.

Figure 6-8. Landing Requirements in Ramps



6. Edge Protection

Edge protection is required on all ramps and ramp landings. Edge protection can be provided by either extending the width of the ramp and landings 1 ft. minimum beyond the inside face of the handrails or providing a curb or barrier that prevents the passage of a 4 in. diameter sphere, where any portion of the sphere is within 4 in. of the finished surface.

7. Handrails

PROWAG compliant handrails are required on all ramps that have a ramp rise of 6 in. or greater. Handrails should be continuous the full length of the ramp and shall be between 2.8 ft and 3.2 ft above the finished surface of the ramp. Handrails shall extend 1 ft. beyond the top and bottom of the ramp runs. See PROWAG Section R409 for additional physical requirements for handrails including, but not limited to, height, cross section, and extensions. Handrails should be designed and located in accordance with requirements of the AASHTO Roadside Design Guide. Where required, handrails should

be located outside of the roadway clear zone whenever feasible. When they cannot be located outside of the clear zone, the designer should refer to the methodology of the AASHTO Roadside Design Guide to reduce the likelihood and severity of the obstacle being struck.

8. Stairs

As a best practice, providing stairways along with ramps, where possible, benefits pedestrians with heart disease, limited stamina, and others for whom distance presents a greater barrier than steps. Stairs should be designed and located in accordance with requirements of the AASHTO Roadside Design Guide. Where required, stairs should be located outside of the roadway clear zone whenever feasible. When they cannot be located outside of the clear zone, the designer should refer to the methodology of the AASHTO Roadside Design Guide to reduce the likelihood and severity of the obstacle being struck.

H. Sidewalk at Driveways

1. General

Sidewalk across driveways shall comply with the general requirements for accessible sidewalk (running slope, cross slope, surface, clear width). Accessible sidewalk configurations at driveways are shown in Standard Drawings SD_2-24 and SD_2-25.

6.3.2 Pedestrian Street Crossings (Crosswalks)

A. General

Pedestrian street crossings are roadway crossings that connect Pedestrian Access Routes on opposite sides of a roadway. A Pedestrian Access Route shall be provided where pedestrian access across a roadway is permitted. Where pedestrian street crossings are deemed to be unsafe or unsuitable for all pedestrians, the designer should consider measures to prohibit pedestrian crossings, such as signage, landscaping, and pedestrian barriers.

B. Running Slope

Where Pedestrian Access Routes are contained within the pedestrian street crossing, the running slope of the Pedestrian Access Route shall not exceed 5%. This is generally equal to the roadway cross slope in perpendicular crossings.

C. Cross slope

The cross slope of pedestrian street crossings is generally equal to the roadway profile in perpendicular crossings. Designers should consider this requirement for initial, interim, and ultimate configurations when setting roadway grades to allow for compliant pedestrian crossings. For example, if an intersection is initially constructed as a Two-Way-Stop-Controlled

intersection but expected to ultimately be converted to an All-Way-Stop-Controlled intersection, all roadway grades must be set at 2% or flatter to accommodate compliant crosswalks in the ultimate condition.

1. Yield or stop controlled intersections:

The cross slope of a pedestrian street crossing at an intersection with yield or stop control that is within the Pedestrian Access Route shall not exceed 2%. A cross slope of 1.8% is recommended for design to allow for construction tolerance. This requirement may require the roadway profile to be “tabled” across the pedestrian street crossing. See **Figure-6-9**.

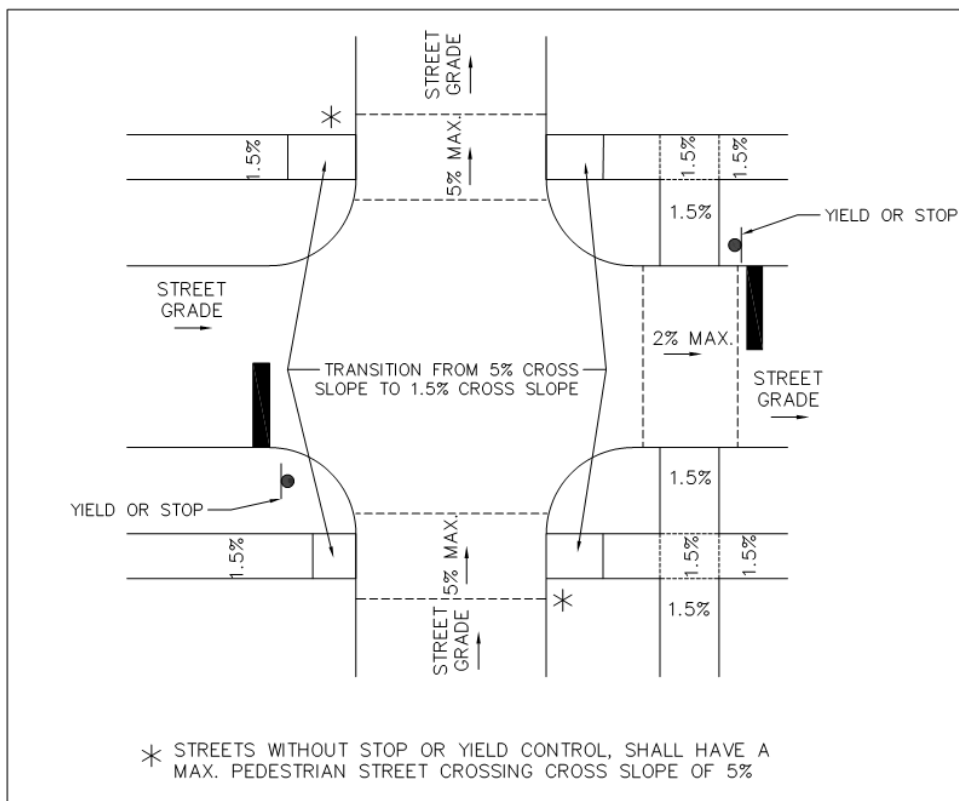
2. Intersections without yield or stop control:

The cross slope of a pedestrian street crossing at an intersection without yield or stop control or at a signalized intersection that is within the Pedestrian Access Route shall not exceed 5%. When traffic signals are designed to allow for arrival during the green phase on an approach, that approach is considered to be without stop or yield control because vehicles could traverse the intersection without slowing or stopping. See **Figure-6-9**.

3. Midblock Crossings:

Where a midblock crosswalk is approved by the ECM Administrator, the cross slope of the midblock pedestrian street crossing within the Pedestrian Access Route shall not exceed the profile grade of the street or highway.

Figure 6-9. Example Street Intersection



D. Roundabouts

Design of accessible Pedestrian Access Routes at roundabouts requires careful design to provide guidance to pedestrians who are blind or have low vision because the crossings are located off to the side of the Pedestrian Circulation Path around the street or highway. Water fountains and other features that produce background noise should not be used in the middle of the roundabouts as pedestrians who are blind or have low vision rely on audible cues to help detect gaps in traffic.

Designers should refer to PROWAG R306.3 and other roundabout guidance when designing pedestrian facilities. Care should be taken to provide directional cues, separating the Pedestrian Access Route from the roadway with a landscape buffer, and locating the pedestrian street crossings set-back from the central island. Roundabouts with multi-lane approaches involve an increased risk of pedestrian exposure to accident when compared to those with single-lane approaches.

6.3.3 Curb Ramps/Blended Transitions

Curb ramps and blended transitions are used to transition the Pedestrian Access Route (sidewalk) to a pedestrian street crossing (crosswalk). Curb ramps and blended transitions shall comply with the requirements of this section. Selection of the type of curb ramp to be used at a given location should be based on:

- Intersection geometry
- Attached or detached sidewalk configuration
- Drainage
- Coordination with utilities and other roadside elements

Designers should design curb ramps individually, check critical slopes, ensure drainage does not pond in ramps, and consider directionality of the crossing. Designers are encouraged to use flatter slopes, where possible, to allow for flexibility during construction. Designers should use ramps conforming with standard drawings SD_2-40, SD_2-41, SD_2-42, and SD_2-50 whenever feasible. When physical constraints prevent the application of these standard ramp designs, the designer should develop a design that fits project constraints and conforms with the requirements of this section to be approved by the ECM Administrator on a case-by-case basis. Designers are advised to see CDOT M-608-1 standard drawings for guidance in these cases.

A. Common Requirements for Curb Ramps & Blended Transitions

1. Clear Width

The minimum clear width of curb ramps, blended transitions, and turning spaces is 4 ft. Widths should generally match the approaching sidewalk.

2. Grade Breaks

Grade breaks at the top and bottom of curb ramps shall be perpendicular to the direction of the ramp running slope. Grade breaks are not permitted within curb ramps and turning spaces. Surface slopes that meet at grade breaks shall be flush.

3. Counter Slope

The maximum counter slope of the gutter or street at the bottom of a curb ramp, blended transition, or turning space is 5%.

4. Clear Space

A minimum clear space of 4 ft. x 4 ft. shall be provided at the bottom of all curb ramps and blended transitions. The clear space shall be contained within the width of the pedestrian street crossing and be completely outside of the parallel vehicle travel lane. The cross slope of the clear space shall be equal to the street or highway grade. The maximum running slope of the clear space is 5% to comply with counter slope requirements.

B. Perpendicular Curb Ramps

1. General

Perpendicular curb ramps have a running slope that cuts through or is built up to the gutter grade break at right angles.

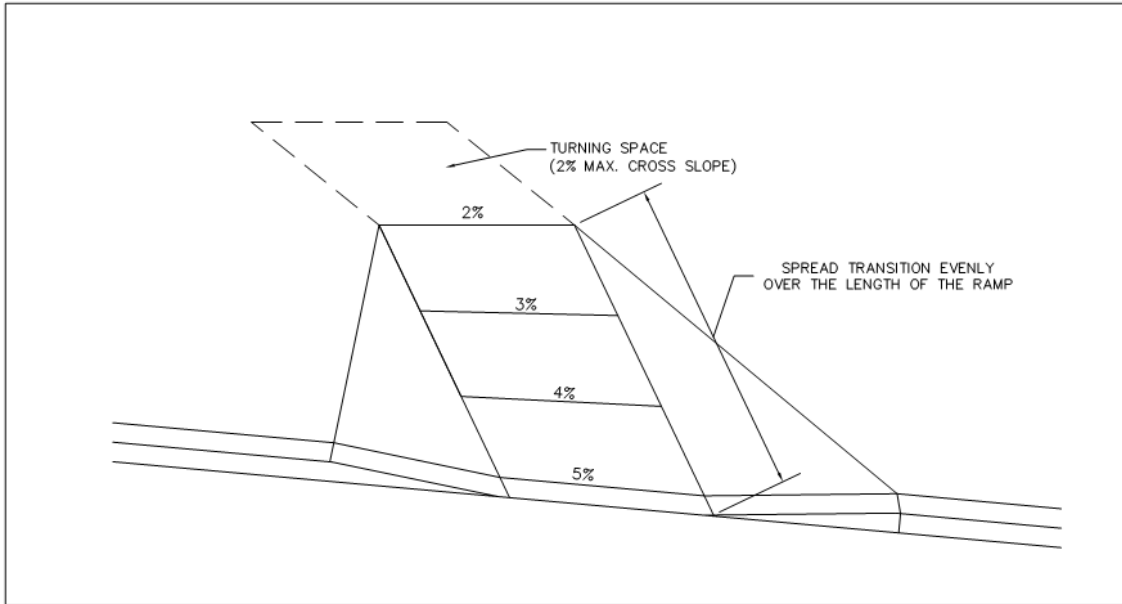
2. Running Slope

Provide the flattest running slope possible on curb ramps, while maintaining adequate drainage. The running slope of a curb ramp is between 5% and 8.3%, but shall not require the ramp length to exceed 15 ft. A maximum running slope of 7.5% is recommended for design to allow for variability during construction, since construction tolerance is not allowed.

3. Cross slope

The cross slope of curb ramps within the Pedestrian Access Route and at a stop or yield-controlled intersection shall not exceed 2%. A cross slope of 1.5% is recommended for design to allow for construction tolerance. The cross slope at intersections without stop or yield control shall not exceed 5%. The cross slope at midblock crossings can match the street or highway running slope. Where the ramp cross slope must exceed 2% in order to match a roadway grade greater than 2% at the end of the ramp, transition the ramp above the clear space to match the roadway grade. Spread the transition evenly over the length of the ramp. See **Figure 6-10**.

Figure 6-10. Transitioning Cross Slope Across Curb Ramp



4. Turning Space

A 4 ft. x 4 ft. minimum turning space shall be provided at the top of the curb ramp and may overlap other turning and clear spaces. If the turning space is constrained at the back of the sidewalk, the turning space shall be 4 ft. x 5 ft. minimum. The 5 ft. dimension shall be provided in the direction of the ramp running slope. The maximum running slope of a turning space is 2%. Use 1.5% where practicable to allow for construction tolerance.

5. Flared Sides & Returned Curbs

Where the Pedestrian Circulation Path crosses the curb ramp, the slope of the side flares shall not exceed 10%. A side flare slope of 9.5% is recommended to allow for construction tolerance. If the sides of a perpendicular ramp are not contained within the Pedestrian Circulation Path (e.g., detached sidewalk configurations) and are protected from cross travel by landscaping, street furniture, or other elements, 1'-6" flared sides should be used as shown in the standard drawings. Returned curbs in lieu of 1'-6" flared sides may be approved by the ECM Administrator on a case-by-case basis if the directional cues they provide to pedestrians who are blind or have low vision are important in the design.

C. Parallel Curb Ramps

1. General

Parallel curb ramps have a running slope that is aligned with the direction of sidewalk travel and lower the sidewalk to a level turning space where a turn is made to enter the pedestrian street crossing.

2. Running Slope

Provide the flattest running slope possible on curb ramps, while maintaining adequate drainage. The running slope of a curb ramp is between 5% and 8.3%, but shall not require the ramp length to exceed 15 ft. A recommended maximum running slope of 7.5% is recommended for design to allow for variability during construction, since construction tolerance is not allowed.

3. Cross slope

The cross slope of parallel curb ramps within the Pedestrian Access Route shall not exceed 2%. A typical cross slope of 1.5% is recommended for design to allow for construction tolerance.

4. Turning Space

A 4 ft. x 4 ft. minimum (5 ft. x width of sidewalk is preferred) turning space shall be provided between the parallel ramps to allow the pedestrian to turn and cross the street. The maximum running slope of the turning space is 2%. A running slope of 1.5% is recommended for design to allow for construction tolerance. The maximum cross slope of the turning space at a stop or yield-controlled intersection is 2%. The cross slope at intersections without stop or yield control shall not exceed 5%. The cross slope of the turning space at midblock crossings can match the street or highway running slope. If the turning space is confined (by a building or other adjacent feature that would impact a pedestrian turning) on two or more sides, the turning space shall be 4 ft. x 5 ft. minimum. The 5 ft. dimensions shall be provided in the direction of the pedestrian street crossing.

D. Blended Transitions

1. General

Blended transitions are raised pedestrian street crossings, depressed corners, or similar connections at the level of the sidewalk and the pedestrian street crossing that have a running slope of 5% or less.

2. Running Slope

Provide the flattest running slope possible on blended transitions, while maintaining adequate drainage. The maximum running slope of blended transitions is 5%.

3. Cross slope

The cross slope of blended transitions within the Pedestrian Access Route and at a stop or yield-controlled intersection shall not exceed 2%. A cross slope of 1.5% is recommended for design to allow for construction tolerance. The cross slope at intersections without stop or yield control shall not exceed 5%. The cross slope at midblock crossings can match the street or highway running slope. When the blended transition cross slope must exceed 2% in order to match a roadway grade greater than 2% at the end of the blended transition, transition the blended transition to match the roadway grade. Spread the transition evenly over the length of the blended transition. See

Figure 6-10.

E. Diagonal Curb Ramps

A single diagonal curb ramp is not permitted to serve two pedestrian street crossings on a corner. Single diagonal curb ramps must be approved by the ECM Administrator and will only be considered as part of an alteration project where existing physical site constraints prevent two curb ramps from being installed. Diagonal curb ramps are not desirable because they can provide directional cues that lead pedestrians, especially those that are blind or have low vision, into the middle of an unsafe intersection.

6.3.4 Detectable Warning Surfaces (DWS)

Detectable warning surfaces shall consist of truncated domes aligned in a square or radial grid pattern. Detectable warning surfaces shall be provided where a curb ramp, landing, or Shared Use Path connects to a pedestrian street crossing, railroad crossing, traffic island or median. Detectable warning surfaces shall be made of cast iron with a patina natural finish and in accordance with the requirements of PROWAG Section R305. See SD_2-40, SD_2-41, SD_2-42, and SD_2-50 for details. See CDOT standard drawings M-608-1 for location and placement of DWS.

6.3.5 Medians/Pedestrian Refuge Islands

A. Clear Width

The minimum clear width of Pedestrian Access Routes contained within a median or pedestrian refuge island is 5 feet.

B. Grade

The grade of the Pedestrian Access Route through medians and pedestrian refuge islands shall comply with the running slope requirements for crosswalks. See Section 6.3.2.

C. Cross slope

The cross slope of the Pedestrian Access Route through medians and pedestrian refuge islands shall comply with the cross slope requirements for crosswalks. See Section 6.3.2.

D. Curb Ramps

Curb ramps and blended transitions in medians and pedestrian refuge islands shall meet the requirements of Section 6.3.3.

E. Detectable Warning Surfaces

When a cut-through pedestrian refuge island is 6 feet wide or greater from the face of curb to face of curb, Detectable Warning Surfaces shall be installed. When installed, the Detectable Warning Surfaces must be separated by a surface without Detectable Warning Surface that is a minimum of 2 feet in length (parallel to pedestrian travel). If this 2-foot space cannot be provided, Detectable Warning Surfaces shall not be installed because the island is not wide enough to be considered a pedestrian refuge island.

F. Pedestrian Signals

Where pedestrian signals are provided and the pedestrian crossing phase is not designed to be long enough to permit crossing across the entire street, additional pushbuttons complying with Section 6.3.6 should be provided in the pedestrian refuge islands to actuate the pedestrian phase in order for pedestrians to complete the crossing.

6.3.6 Pedestrian Signals/Pushbuttons

A. General Requirements

Requirements for application of pedestrian signals shall be in accordance with Section 4.03 of the MUTCD. Where installed, including at Shared Use Path crossings, all accessible pedestrian signals and pushbuttons shall be designed in accordance with Sections 4E.08 through 4E.13 of the latest version of the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD). See CDOT standard drawings S-614-45 for guidance on location of pedestrian pushbuttons.

B. Applicability in Alterations

Per PROWAG requirements, if the existing signal controller and software are altered, or if the existing signal head is replaced, the pedestrian pushbuttons and pedestrian signal heads shall be updated to meet the accessible pedestrian signal requirements contained in this section, unless a deviation is approved by the ECM Administrator.

C. Pedestrian Signal Phase Timing

All pedestrian signal timing shall be based on a pedestrian clearance time that is calculated using a pedestrian walking speed of 3.5 ft/s or less and a crossing distance from the end of the curb ramp to the far side of the traveled way or the near side of a pedestrian refuge island with secondary pushbutton.

D. Pushbutton Separation

Pedestrian pushbuttons shall be spaced a minimum of 10 feet apart to allow for pedestrians who are blind or have low vision to identify the correct crosswalk. If it is not feasible for the pedestrian pushbuttons to be spaced 10 feet apart, they may be placed closer than 10 ft apart or on the same pole. In these cases, the accessible pedestrian signals shall use speech messages. See Section 6.3.6.G.

E. Pushbutton Locations

Pushbuttons should be located as close as possible to the curb ramp they are servicing and be adjacent to a clear and level (< 2% slope in all directions) platform. The pushbutton should be located within 5 ft. of the edge of the far crosswalk line and between 1.5 ft. to 6 ft. from the face of the curb or edge of pavement. Where there are physical constraints that make locating the pushbutton within 6 feet from the face of curb or edge of pavement infeasible, they should not be located farther than 10 feet from the face of curb or edge of pavement.

F. Pushbutton Mounting Heights and Reach Length

Pushbuttons shall be mounted between 42 inches and 48 inches above the surface of the accessible route. The preferred mounting height is 42 inches. The pushbutton should not require a pedestrian to reach more than 10 inches to activate it. See Section 6.3.10.B.2.

G. Accessible Pedestrian Signals (APS)

Accessible Pedestrian Signals shall have audible and vibrotactile walk indications located on the pushbutton, locator tones, and tactile arrows.

1. Where pedestrian pushbuttons on one corner are separated by at least 10 feet, the audible walk indication shall be a percussive tone. Where two accessible pedestrian signals on one corner are on the same pole or separated by less than 10 feet, the audible walk indication shall be a speech message patterned after the model, "Broadway. Walk sign is on to cross Broadway."

6.3.7 Shared Use Paths

Shared Use Paths are facilities on separate right-of-way, easements, or tracts or otherwise physically separated from roadways that are designed for use by bicycles, pedestrians, and other non-automotive modes of recreation and transportation. Because these facilities are used by pedestrians, they shall be accessible and in compliance with the requirements of this chapter. Shared Use Paths are also called Multi-Use Paths in other ECM Chapters. The two terms are synonymous.

A. General

Design of accessible Shared Use Paths should comply with the requirements in the ECM. Designers should also refer to the current version of the *AASHTO Guide for the Development of Bicycle Facilities* for additional design guidance.

B. Clear Width

The requirements of a Pedestrian Access Route shall be met for the full width of the Shared Use Path, i.e. the entire width of the Shared Use Path must be fully accessible. The minimum clear width of a Shared Use Path is 10 ft. See Section 2.5.7.

C. Grade

The grade of a Shared Use Path within or adjacent to public roadways shall be less than or equal to the adjacent street grade. Whenever feasible, the grade of the Shared Use Path shall be less than or equal to 5%.

D. Cross slope

The cross slope of Shared Use Paths shall not exceed 2%. A cross slope of 1.5% is recommended for design to allow for variability during construction.

E. Curb Ramps

Curb ramps on Shared Use Paths shall meet the requirements of Section 6.3.3, except that the width of the curb ramp shall be equal to the full width of the Shared Use Path.

6.3.8 Transit Stops

Transit stops and facilities shall comply with requirements of Section 2.5.4 and those of the transit provider.

A. Boarding and Alighting Areas

1. Location

Wherever feasible, transit stops should be located where the adjacent street grade is less than 2.5% to facilitate passenger boarding. Bollards and other potential obstructions shall be located so as not to protrude into the boarding and alighting area or Pedestrian Access Route or obstruct the boarding process.

2. Surface

The surface of transit stops shall meet the requirements of Section 6.3.1.F.

3. Connectivity

Transit platforms, shelters, and boarding/alighting areas shall be connected to streets, sidewalks, and Pedestrian Circulation Paths by accessible Pedestrian Access Routes.

4. Dimensions

Boarding and alighting areas shall provide a minimum clear length of 8 ft. measured perpendicular to the curb and a minimum clear width of 5 ft. measured parallel to the roadway. See **Figure 6-11**.

5. Slope

The slope of the boarding and alighting area parallel to the roadway should be the same as the roadway grade. The maximum running slope of the boarding and alighting area perpendicular to the roadway is 2%. A running slope of 1.5% is recommended for design to allow for construction tolerance. See **Figure 6-11**.

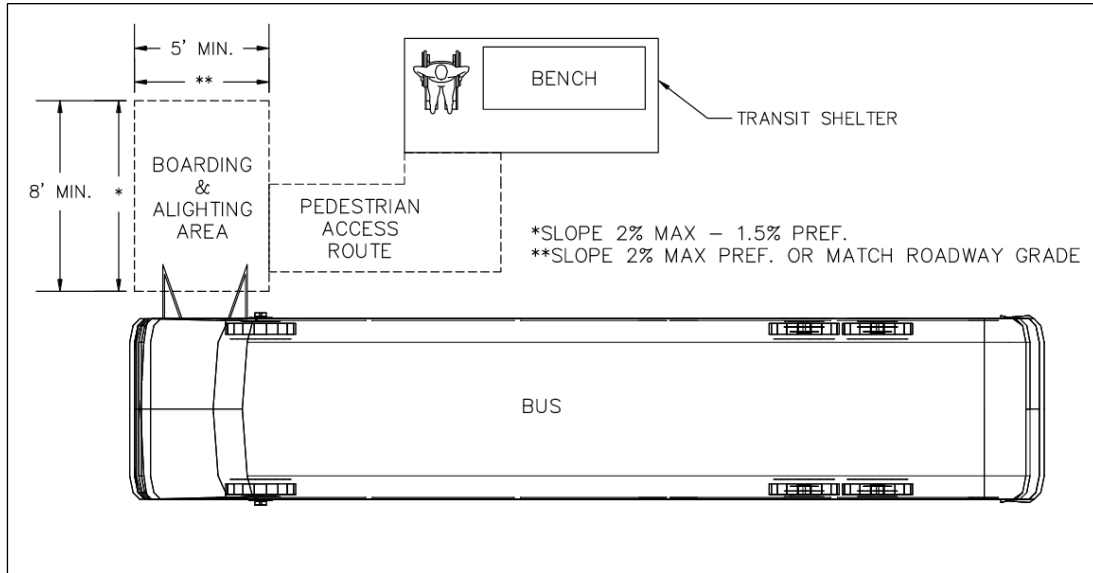
6. Detectable Warning Surfaces

Detectable warning surfaces are not required at boarding and alighting areas for bus-only transit stops. They are required for boarding and alighting areas for rail vehicles and buses AND rail vehicles.

B. Transit Shelters

Transit shelters shall be connected to boarding and alighting areas by Pedestrian Access Routes. The boarding and alighting area may be located either within or outside of the shelter. Transit shelters shall provide a minimum 2.5 ft. x 4 ft. clear space entirely within the shelter. If seating is provided within the shelter, the clear space shall be located at one end of the seating or shall not overlap the area within 1.5 ft. of the front of the seating. The clear space shall have a running slope consistent with the grade of the adjacent Pedestrian Access Route and cross slope of 2% maximum. See **Figure 6-11**.

Figure 6-11. Boarding & Alighting Area Connection to Transit Shelter



6.3.9 Pedestrian Over/Underpasses

A. General

Provide Pedestrian Access Routes on overpasses and underpasses to connect with Pedestrian Access Routes on both sides of the structure. If pedestrian bridges over waterways are installed as part of Pedestrian Access Routes or Shared Use Paths, they shall comply with the requirements of a Pedestrian Access Route.

B. Ramps, Lifts, Elevators

If the approach slopes of the overpass or underpass exceed 5%, then a ramp, lift, or elevator shall be provided to provide access.

6.3.10 Ancillary Elements

A. Signage (Pedestrians)

Signs providing directions, warnings, or other information for pedestrians only, excluding transit signs, shall comply with PROWAG R410 in addition to the MUTCD with revisions and supplements.

B. Operable Parts

Operable parts consist of pedestrian signals, pushbuttons, and other similar elements that are to be operated by pedestrians.

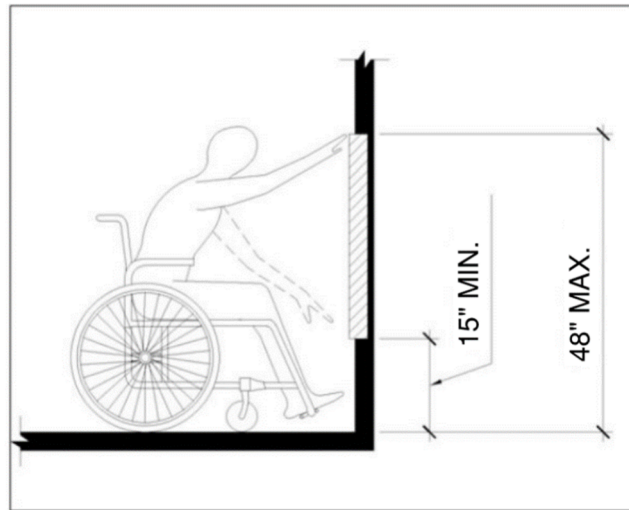
1. Clear Space

Provide a 2.5 ft. x 4 ft. minimum clear space adjacent to the operable part. The cross slope of all sidewalk contained within the Pedestrian Access Route shall not exceed 2%. A cross slope of 1.5% is recommended for design to allow for construction tolerance. The running slope of the clear space shall match the grade of the adjacent Pedestrian Access Route.

2. Height/Reach Ranges

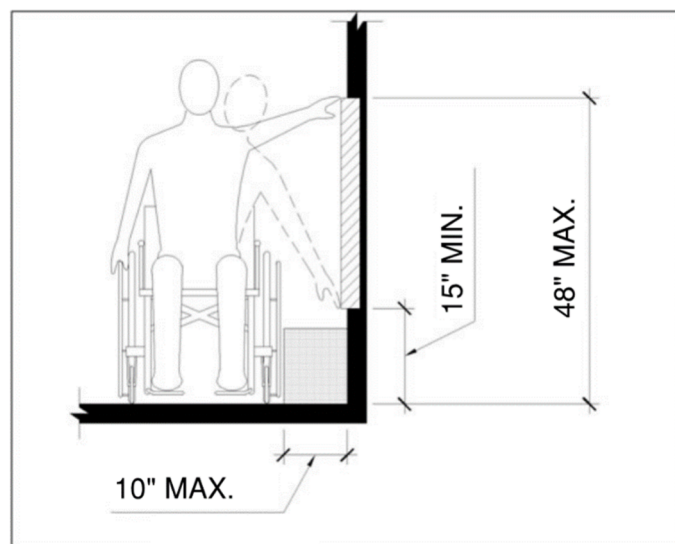
- **Forward Reach:** An operable part shall be located between 15 in. and 48 in. above the finished surface when a forward reach is required to activate the operable part. An obstruction is not allowed between the operable part and the clear space. See **Figure 6-12**.

Figure 6-12. Forward Reach Range



- **Side Reach:** An operable part shall be located between 15 in. and 48 in. above the finished surface when a side reach is required to activate the operable part. An obstruction is allowed between the operable part and the clear space if the obstruction protrudes less than 10 inches from the operable part. See **Figure 6-13**.

Figure 6-13. Side Reach Range



3. Operation

Operable parts shall be able to be operated with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The maximum force required to operate the operable parts is 5 pounds.

4. Mailboxes

Both single and cluster mailboxes shall be located along an accessible Pedestrian Access Route within accessible reach ranges and with clear spaces in accordance with the requirements of this section. Mailbox locations must also comply with U.S. Postal Service and other requirements. See Section 4.4.

5. Elements not permitted in ECM

The items listed below are not permitted by the ECM without a deviation approved by the ECM Administrator. If a deviation is approved, the designer shall refer to PROWAG for specific accessibility requirements.

- Street furniture other than at transit stops
- On-Street Parking (Marked or Metered)
- Access Aisles (Marked or Metered On-Street Parking or Passenger Loading Zones)
- Parking Meters and Pay Stations
- Passenger Loading Zones
- Stairs, Elevators, Escalators, and Lifts
- Doors, Doorways, and Gates

6.3.11 Pedestrian Access Routes in Work Zones during Construction and Maintenance

Pedestrian access in Work Zones and Temporary Traffic Control (TTC) Zones shall be provided in accordance with MUTCD Section 6D.01.04, *“If the TTC zone affects the movement of pedestrians, adequate pedestrian access and walkways shall be provided. If the TTC zone affects an accessible and detectable pedestrian facility, the accessibility and detectability shall be maintained along the alternate pedestrian route.”* Pedestrian accommodation in TTC zones shall not conflict with adopted CDOT Traffic Control Standards.

A. Planning for Pedestrians in Temporary Traffic Control (TTC) Zones

Planning for pedestrians should be incorporated in the development of Traffic Control Plans for all projects within or adjacent to public roadways. In some cases, pedestrian demand will be low and accommodation measures will be minimal. In other cases where pedestrian demand is high, dedicated temporary pedestrian facilities will be required. In accordance with MUTCD Section 6D.01.07, *“The following three items should be considered when planning for pedestrians in TTC zones:*

1. *Pedestrians should not be led into conflicts with vehicles, equipment, and operations.*
2. *Pedestrians should not be led into conflicts with vehicles moving through or around the worksite.*
3. *Pedestrians should be provided with a convenient and accessible path that replicates as nearly as practical the most desirable characteristics of the existing sidewalk(s) or footpath(s).”*

B. Approaches to accommodating pedestrians in work zones

Technical requirements of Pedestrian Access Routes are also applicable in temporary work zones to the extent feasible. In order, the preferred methods for maintaining or providing Pedestrian Access Routes in TTC Zones are:

1. Maintain the existing pedestrian facilities (sidewalks, footpaths, etc.) whenever feasible.
2. When the existing Pedestrian Access Route must be closed or blocked, develop an Alternate Pedestrian Route and Pedestrian Circulation Path parallel to the existing pedestrian facility on the same side of the street.
3. When a parallel alternative Pedestrian Access Route cannot be developed on the same side of the street, an alternative pedestrian route (detour) may be provided on the other side of the street or outside of the TTC zone.

C. Traffic Control Devices

All barricades, signs, and other temporary traffic control devices used to protect and direct pedestrians in TTC Zones shall be compliant with the MUTCD. The temporary facilities shall be detectable and include accessibility features consistent with the features of the existing pedestrian facilities. Pedestrian barriers and channelizing devices shall be detectable.

Pedestrian barricades should be placed between the Pedestrian Access Route and the work site in a location that protects pedestrians from hazards and provides guidance to the location of the alternate pedestrian route.

D. Short Duration Monitoring

For short durations, such as those required for moving equipment or traffic control set-up and phase changes, the Pedestrian Access Route may be monitored by construction personnel who can provide guidance and direction to pedestrians until the Pedestrian Access Route through the work zone is restored or completed.

6.4 INSPECTION AND ACCEPTANCE

Inspection and acceptance of all accessible pedestrian facilities shall be based on the requirements in this chapter and in accordance with Chapter 5 and Appendix J. According to the ADA and PROWAG, ALL portions of the Pedestrian Access Route and associated elements must be accessible. Pedestrian facilities may be inspected at one or more locations, as determined by the project inspector, to verify that the facilities meet the requirements of this chapter. Standard Pedestrian Access Route and Curb Ramp Inspection Forms will be used for inspection and acceptance.

Table 6-3 summarizes the requirements for the most common accessible pedestrian elements. In no case shall the minimum, maximum, or ranges be deviated from in design without a deviation approved by the ECM Administrator. The construction tolerances shown are ONLY applicable during construction. Designers are encouraged to utilize design values greater than the minimums and less than the maximums to reduce noncompliant and unacceptable work during construction.

Table 6-3 – Common Design Values and Construction Tolerances

Element	Design Values			Construction Tolerance
	Minimum	Maximum	Range	
P.A.R. Width	4 ft. ¹	--	--	- 1/4"
P.A.R. Grade	N/A ²	5.0% ³	--	+0.5%
P.A.R. Cross Slope	N/A ²	2.0%	--	+0.5%
Ramp Run Slope	--	--	5.0-8.3%	None
Ramp Run Rise	N/A	2.5 ft. ⁴	--	+ 1/4"
Ped. Street Crossing Cross Slope	N/A ²	2.0% ⁵ 5.0% ⁶ Adj. Str. Gr. ⁷	--	+0.5%
Ped. Street Crossing Running Slope	N/A ²	5.0%	--	+0.5%
Curb Ramp Width	4 ft. ^{8,13}	--	--	- 1/4"
Curb Ramp Cross Slope	N/A ²	2.0% ⁹	--	+0.5%
Curb Ramp Running Slope	--	--	5.0-8.3%	None
Curb Ramp Counter Slope	N/A ²	5.0%	--	+0.5%
Curb Ramp Turning Space Slopes	N/A ²	2.0% ¹⁰	--	+0.5%
Curb Ramp Flare Slope	N/A	1'-6" Flare ¹¹ 10.0% ¹²	--	+0.5% ¹²
Shared Use Path Width	10 ft.	--	--	- 1/4"
Shared Use Path Grade	N/A ²	5.0% ³	--	+0.5%
Shared Use Path Cross Slope	N/A ²	2.0%	--	+0.5%

NOTES:

1. Minimum width for Pedestrian Access Route. Design minimum should be per design criteria in Chapter 2.
2. No minimum slope or grade specified. But positive drainage without ponding should be ensured through combination of grade and cross slope.
3. Where adjacent street grade is greater than 5.0%, P.A.R. grade may equal adjacent street grade.
4. Consecutive Ramp Runs with 2.5 ft. maximum rise may be separated by landings.
5. At intersections/approaches with stop or yield control.
6. At intersections/approaches without stop or yield control, including traffic signals.
7. At mid-block crossings.
8. Minimum for accessibility. Should also be equal to approach sidewalk widths.
9. At top of curb ramp. Transition to match compliant crosswalk cross slope at bottom of ramp.
10. Slope in any direction. May match adjacent street grade at bottom of ramps.
11. Where curb ramp flare is protected from cross travel (detached sidewalks).
12. Where curb ramp flare is in Pedestrian Circulation Path (attached sidewalks).
13. For Shared Use Paths, curb ramp width equals the full Shared Use Path width.