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SUBJECT: Revisions to Design Manual, Part 2 Highway Design March 2015 Edition, Change No. 13		
INFORMATION AND SPECIAL INSTRUCTIONS: Incorporate the attached revisions into the March 2015 Edition of Publication 13M. These updates should be effective as soon as practical without affecting letting schedules, but no later than October 1, 2025. TABLE OF CONTENTS -Updated for consistency with the revisions made as described below. CHAPTER 4 GRADE SEPARATIONS AND INTERCHANGES -Refer to Publication 13, Design Manual Part 2, <i>Contextual Roadway Design</i>, Chapter 7, Grade Separations and Interchanges. CHAPTER 5 LIGHTING -Refer to Publication 13, Design Manual Part 2, <i>Contextual Roadway Design</i>, Chapter 20, Lighting. CHAPTER 10 DRAINAGE DESIGN AND RELATED PROCEDURES -Refer to Publication 13, Design Manual Part 2, <i>Contextual Roadway Design</i>, Chapter 10, Drainage Design and Related Procedures, and all related Appendices. CHAPTER 12 GUIDE RAIL, MEDIAN BARRIER AND ROADSIDE SAFETY DEVICES -Refer to Publication 13, Design Manual Part 2, <i>Contextual Roadway Design</i>, Chapter 12, Roadside Design, and all related Appendices. Any comments or questions regarding the above revisions should be directed to the Highway Design and Technology Division, Bureau of Design and Delivery.		

CANCEL AND DESTROY THE FOLLOWING:

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Design Manual Part 2 Highway Design

Publication 13M - March 2015 Edition

April 2025 Change No. 13

DESIGN MANUAL, PART 2 HIGHWAY DESIGN

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CHAPTER 1

GENERAL DESIGN

Refer to Publication 13, Design Manual Part 2, *Contextual Roadway Design*.

CHAPTER 2

DESIGN ELEMENTS AND DESIGN CONTROLS

Refer to Publication 13, Design Manual Part 2, *Contextual Roadway Design*.

CHAPTER 3

INTERSECTIONS

Refer to Publication 13, Design Manual Part 2, *Contextual Roadway Design*, Chapter 6, Intersections and Driveways.

CHAPTER 4

GRADE SEPARATIONS AND INTERCHANGES

Refer to Publication 13, Design Manual Part 2, *Contextual Roadway Design*, Chapter 7, Grade Separations and Interchanges.

CHAPTER 5

LIGHTING

Refer to Publication 13, Design Manual Part 2, *Contextual Roadway Design*, Chapter 20, Lighting.

CHAPTER 6

PEDESTRIAN FACILITIES AND THE AMERICANS WITH DISABILITIES ACT

6.0 INTRODUCTION

Pedestrians are a part of every roadway environment and attention must be paid to their presence in urban as well as rural areas. Pedestrian access, safety and needs must be given full consideration during the planning and design of all transportation projects. The District Traffic Engineer should be consulted to see if there is a history of pedestrian crashes within the project limits or if the route has been declared an unsafe walking route for school children under Pennsylvania Department of Transportation (PennDOT) regulations.

The Americans with Disabilities Act (ADA) of 1990 is a federal civil rights statute that prohibits discrimination against people with disabilities. ADA implementing regulations for Title II prohibit discrimination in the provision of services, programs, and activities by state and local governments. Designing and constructing pedestrian facilities in the public right-of-way that are not usable by people with disabilities may constitute discrimination. Section 504 of the Rehabilitation Act of 1973 (504) includes similar prohibitions in the conduct of federally-funded programs.

Title II, Subpart A, of the ADA covers State and local government services, including the design and construction of buildings and facilities and the operation of government programs. Rulemaking authority and enforcement are the responsibility of the Department of Justice. However, the United States Department of Transportation has been designated to implement compliance procedures relating to transportation, including those for highways, streets and traffic management. The Federal Highway Administration (FHWA) Office of Civil Rights oversees the US DOT mandate in these areas.

ADA accessibility provisions apply to the entire transportation project development process including planning, design, construction and maintenance activities.

This Chapter provides the designer with the general guidance and direction to the Department's design procedures and requirements for the design of pedestrian facilities. There are a number of design facilities that should be considered in projects which will accommodate pedestrians. In special situations, some of these facilities can be used as countermeasures to reduce the potential for pedestrian accidents. These facilities include but are not limited to:

1. Sidewalks
2. Grade separations (overpasses and underpasses)
3. Refuge islands
4. Pedestrian barriers
5. Installation of pedestrian signals and pedestrian push buttons
6. Prohibition of pedestrians (on interstate highways, some intersections, or by statute or permit)
7. Widening of shoulders (in rural areas)
8. Improvements or installation of lighting
9. Installation of special signing and pavement markings
10. Prohibition of vehicle parking
11. Designation of one-way streets

The following references provide additional guidance for accessibility issues to assist in the determination of pedestrian needs and/or design of pedestrian accommodation within the highway right-of-way. The following documents were used in the development of PennDOT's standards and policies.

- Publication 10, Design Manual, Part 1, *Transportation Program Development and Project Delivery Process*, including Publication 10X, Design Manual, Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix S, Bicycle and Pedestrian Checklist
- PennDOT Training Manual, "Pennsylvania Pedestrian and Bicyclist Safety and Accommodation"
- AASHTO - "A Policy on Geometric Design of Highways and Streets" - 2011 AASHTO Green Book

- AASHTO - "Guide for the Planning, Design and Operation of Pedestrian Facilities" - 2004
- U.S. Access Board, "Draft Public Rights-of-Way Accessibility Guidelines" (PROWAG)
- U.S. Access Board, "Special Report: Accessible Public Rights-of-Way Planning and Design for Alterations"
- U.S. Department of Transportation, Federal Highway Administration, "Designing Sidewalks and Trails for Access, Part II of II, Best Practices Design Guide"
- U.S. Department of Transportation, Federal Highway Administration, "Manual on Uniform Traffic Control Devices"
- 67 PA Code § 212, Official Traffic Control Devices

6.1 DEFINITIONS

The following definitions will be used in conjunction with the criteria described in this Chapter:

1. Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG) July 26, 2011
www.access-board.gov/prowac/nprm.pdf
2. ADA Compliant Pedestrian Signals. Accessible Pedestrian Signals (APS), a device that communicates information about the WALK phase in audible and vibrotactile formats.
(MUTCD 2009 Edition Section 4E.06)
mutcd.fhwa.dot.gov
3. Alteration Project. A change to a facility in the public right-of-way 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.
4. Blended Transition. A pedestrian walkway connection with a grade of 5 percent or less between the level of the walkway and the level of the roadway crosswalk.
5. Crosswalk. That part of a roadway at an intersection included within the connections of the lateral lines of the sidewalk on opposite sides of the highway, measured from the curbs or, in the absence of curbs, from the edges of the traversable roadway; and, in the absence of a sidewalk on one side of the roadway, that part of a roadway included within the extension of the lateral lines of the existing sidewalk.

Any portion of a roadway at an intersection or elsewhere distinctly indicated for pedestrian crossing by lines or other markings on the surface.
6. Cross Slope. The slope that is perpendicular to the direction of travel.
7. Curb. The edge of a roadway surface which has been raised to contain, protect or form a gutter and is usually made of concrete or cut stone.
8. Curb Ramp. A short pedestrian ramp cutting through a curb or built up to a curb from a lower level.
9. Detectable Warning Surface (DWS). A standardized truncated dome grid surface built in or applied to the pedestrian access route to warn visually impaired people of hazards. The surface is placed where pedestrians will encounter the presence of hazards in the line of travel, such as the edge of roadway and railroads, indicating that they should stop and determine the nature of the hazard before proceeding further.
10. Engineering Judgment. The evaluation of available pertinent information and the application of appropriate principles, standards, guidelines and practices as contained in this Manual and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of highway related facilities. Engineering judgment will be exercised by a licensed Professional Engineer, or by an individual working under the supervision of such Engineer. Documentation of engineering judgment is not required but is desirable when determining if ADA accessibility facilities cannot be designed to the maximum extent feasible.

- 11. Intersection.** A roadway area formed by the connection of lateral curb lines or the lateral roadway boundaries of two or more highways or streets that join each other. Alley or driveway junctions normally do not constitute an intersection.
- 12. Island.** A defined area between traffic lanes for control of vehicular movements or for pedestrian access and refuge. It includes all end protection and approach treatments. A median located within an intersection area is also considered to be an island. See Refuge Island.
- 13. Landing.** An approximately level [1V:50H (2.00%) maximum in longitudinal slope and cross slope] part of a pedestrian accessible route or walkway that provides a space for performing turning maneuvers, resting or accessing pushbuttons.
- 14. MUTCD.** Manual on Uniform Traffic Control Devices (2009 Edition)
mutcd.fhwa.dot.gov
- 15. New Construction Projects.** A highway new construction project is the construction of a transportation facility where none existed, in a location without existing site constraints, where it is technically feasible to fully meet the standards for accessibility.
- 16. Pedestrian.** A person traveling on foot or using assistive devices, such as wheelchairs, for mobility.
- 17. Pedestrian Access Route (PAR).** A continuous and unobstructed walkway within a pedestrian circulation path that provides accessibility. Pedestrian accessible routes may include parking access aisles, curb ramps, crosswalks at vehicular ways, walks, ramps, and lifts.
Draft Public Rights of Way Accessibility Guidelines (PROWAG)
www.access-board.gov/prowag/draft.htm
- 18. Pedestrian Facilities.** A general term denoting improvements and provisions made to accommodate or encourage non-vehicular transit.
- 19. Pedestrian Grade Separation Facilities.** An accessible pedestrian traffic separation structure either over or under the roadway elevation (grade) of the vehicular traffic lanes providing a safe pathway access across the roadway.
- 20. Physical Barrier.** A physical obstruction (i.e. fence, planter, guide rail, etc.) which prohibits a pedestrian movement. Placement of intentional physical barrier to deter pedestrian movements must be outside the vehicular line of sight and clear zone.
- 21. Public Right-of-Way.** Consists of everything between the highway right-of-way limits, including travel lanes, medians, refuge islands, planting strips, sidewalks and other facilities of a roadway system.
- 22. Ramp.** Any part of a constructed pedestrian pathway with a slope greater than 1V:20H (5.00%).
- 23. Refuge Island.** A specifically defined area (most often raised above the street level) between vehicular traffic lanes intended as a pedestrian refuge location for persons unable to cross the entire roadway width at one time.
- 24. Running Slope,** also known as longitudinal slope. The slope that is parallel to the direction of travel.
- 25. Sidewalk.** A portion of a roadway between curb lines or the lateral line of a roadway and the adjacent property line or easement of private property that is paved or improved and intended for use by pedestrians.
- 26. Shoulder.** A section of a roadway system adjacent to the traveled way that may be shared by motorized vehicles, horse drawn vehicles, bicycles, and pedestrians. The shoulder facilitates drainage, supports the roadway and provides a buffer between vehicles and pedestrians.

27. Site Infeasibility. Existing physical or site constraints which prohibit the incorporation of elements, spaces or facilities that are in full and strict compliance with the minimum requirements for new construction and which are necessary to provide pedestrian access, circulation and use.

28. Technically Infeasible. A finding that alterations to an existing facility cannot fully meet the standards because of existing site conditions that would require additional work, right-of-way acquisition or impacts, not included in the original scope or limits of the alteration project. Existing site constraints such as limited right-of-way, existing utilities, existing structures, environmental/historic impacts or other site constraints may also prohibit modification or addition of elements, spaces, or facilities that are in full and strict compliance with the standards (e.g., curb ramps may be constructed with slopes greater than 1V:12H (8.33%) where space limitations prohibit the use of flatter slopes). Where full compliance is found to be technically infeasible, these curb ramps must use slopes that provide access to the maximum extent feasible.

29. Traffic Control Device. A sign, signal, pavement marking, or other device used to regulate, warn, or guide traffic that is placed on, over, or adjacent to a street, highway, pedestrian facility, or shared-use path by authority of a public agency having jurisdiction.

30. Transition Plan. The Transition Plan should identify all current physical obstacles that limit accessibility to individuals with disabilities, describe in detail the methods that will be used to make the facilities accessible, specify a schedule for taking steps necessary to achieve compliance and identify the official responsible for implementing the plan. The District Transition Plan Items list will typically not have existing curb ramps that are noncompliant or technically infeasible curb ramps listed. Missing curb ramps will not be added to the District Transition Plan Items list as they will be updated with the next alteration plan. Complaints may result in facilities being added to the District Transition Plan Items list. Rarely, curb ramps that are required as part of an alteration project cannot be completed with that project and must be added to the District Transition Plan Items list. The District Transition Plan Items list is submitted to Central Office for inclusion in the Department Transition Plan. A public entity with 50 or more employees is required to have a Transition Plan.

31. Traveled Way. The portion of the roadway for the movement of vehicles, exclusive of roadway shoulders, berms, sidewalks and parking lanes.

32. Walkway. The continuous portion of a pedestrian access route that is connected to street crossings by curb ramps or blended transitions.

6.2 ADA REQUIREMENTS, STANDARDS AND GUIDELINES

Under the ADA, the United States Access Board has developed and continues to maintain accessibility design guidelines for accessible buildings and facilities known as the 2010 ADA Standards and the Draft Public Rights-Of-Way Guidelines (PROWAG). The 2010 ADA Standards focus mainly on facilities on sites such as buildings and is not always applicable to the public right-of-way. PROWAG provides guidance for facilities located within the public right-of-way that could be affected by constraints posed by space limitations at sidewalks, roadway design practices, slope, and terrain.

The United States Access Board's guidelines become enforceable when they are adopted by the standard setting agency for the ADA. The agencies responsible for standards under the ADA are the Department of Justice (DOJ) and the United States Department of Transportation (US DOT). Both the DOJ and US DOT have accepted the 2010 ADA Standards as standards. It should be noted: the standards and guidelines serve as a means to achieve and/or measure ADA compliancy but are not requirements of ADA.

The requirements of ADA include:

- New construction must be accessible and usable by persons with disabilities. Technical infeasibility should not usually be a factor in its design.
- Alterations to existing facilities, within the scope or limits of a project, must provide usability to the maximum extent feasible.
- Existing facilities that have not been altered shall not deny access to persons with disabilities.

Both the 2010 ADA Standards and PROWAG provide means to meet the requirements of ADA. Facilities located outside of the public right-of-way are governed by the 2010 ADA Standards; and facilities located within the public right-of-way are governed by PROWAG. This is consistent with a February 2006 FHWA memorandum that states the PROWAG will be used as a best practice for facilities located within the public right-of-way, when the 2010 ADA Standards is silent or not applicable. The 2010 ADA Standards, PROWAG and other standards and guidelines have been incorporated into PennDOT's standards and guidelines to achieve ADA compliance.

A. New Construction Projects. All new construction projects that have pedestrian needs will incorporate appropriate pedestrian facilities to be accessible and usable by persons with disabilities. New construction projects for highways and bridges are generally built on new locations where construction space or other existing restrictions are rare. Project cost is not an acceptable reason to fail to construct or delay completing an ADA required improvement for accessibility compliance.

PennDOT's design development process will assess and ensure that accessibility requirements are addressed during the earliest stages possible to reduce or prevent potential conflicts with various planning, right-of-way, environmental, utilities, or other highway design related issues. Project scopes may also need expanded to meet pedestrian needs.

B. Alteration Projects and Removing Existing Pedestrian Access Barriers. A highway alteration project is a change to any portion of an existing facility (space, site, structure, or improvement of a pedestrian or vehicular route) located in the highway right-of-way that affects or could affect usability, access, circulation, or use of the facility. Alterations could affect the structure, grade, function and use of the roadway. Projects such as reconstruction, major rehabilitation, milling, resurfacing, widening, traffic signal installation and pedestrian signal installation all affect access, circulation or use of a facility.

As per Title II of ADA, when a facility is altered, it must be improved or upgraded to meet the latest standards. Where it is technically infeasible to meet the latest standards, access must be provided to the maximum extent possible. See [Section 6.2.B.4](#) for additional discussion on Technically Infeasible. At a minimum, only the altered facilities are required to be improved or upgraded to current standards. It may be cost beneficial to improve unaltered facilities while construction forces are mobilized. Additional improvements may be unavoidable due to the improvement of one facility affecting the use of an adjacent facility. Coordinate with the local municipality or property owner to obtain right-of-way or temporary construction easements for altered facilities located outside of PennDOT right-of-way.

As the ADA standards or PennDOT standards change, a state-wide upgrade of all facilities is not required. Instead, it is systematically initiated by alteration projects. Meaning, if a facility was constructed to an older standard and provides access but has not been altered since construction, the facility does not need to be upgraded. For example, a curb ramp was constructed according to standards before the DWS requirement. If the curb ramp has not been altered and provides access, the curb ramp is technically compliant. Only when the curb ramp, or the pedestrian crossing, is altered must it fully meet the latest standard and in this case include the DWS. Some sidewalk alteration projects may trigger curb ramp upgrades as well.

All alteration type projects must assess pedestrian needs and must improve or upgrade altered existing facilities to the latest standards. See [Section 6.6](#) for tools available to help assess pedestrian needs. The ADA Law, 28 CFR Part 35.151(e) - New construction or alterations provides the general direction for the placement of curb ramps: (1) Newly constructed or altered streets, roads and highways must contain curb ramps or other sloped areas at any intersection having curbs or other barriers to entry from a street level pedestrian walkway. (2) Newly constructed or altered street level pedestrian walkways must contain curb ramps or other sloped areas at intersections to streets, roads, or highways.

During alteration projects curb ramps must be installed or upgraded and must be provided at all street crossings and signalized entrances. "T" intersections may provide only one crossing of the through roadway based on pedestrian needs. Plus intersections may provide only one crossing of the through roadway in the event existing utilities, drains, severe slopes, etc...that are not in the scope of work, make providing an accessible crossing Technically Infeasible. In the rare cases where safety concerns, such as sight distance, warrant pedestrian crossing be prohibited on one or more legs of an intersection, the TE-672 should be completed, see [Section 6.6](#). "No Pedestrian Crossing" signs are only required if crossing is prohibited.

Where existing site constraints limit the ability to fully meet the latest standards, the improvements or upgrades must be done to provide access to the maximum extent feasible within the scope or limits of the designated project. Projects altering the usability of the roadway must incorporate accessible pedestrian improvements at the same time as the alterations to the roadway are performed.

All alteration projects require the removal of the existing pedestrian access barriers, such as missing curb ramps, when they are located within the limits of work. Only in rare situations may the pedestrian access barrier remain and the location of the barrier added to the Transition Plan to be addressed at a later time. Alterations at signalized intersections must follow appropriate traffic signal policies and procedures.

1. Major Alteration Projects. Major alteration projects can affect access, circulation, or use of existing facilities within the existing right-of-way. These alterations can include 4R projects such as resurfacing, restoration, rehabilitation and reconstruction and other alterations such as major widening, bridge projects, interstate safety rest area / welcome center restorations and certain transportation enhancements.

a. Transportation Enhancements (TE) and other Federal-aid Programs. Transportation Enhancements are special projects related to ground transportation facilities that improve the quality of life in Pennsylvania. The TE program includes project categories such as Hometown Streets and other enhancements such as bicycle and pedestrian paths, streetscapes, scenic overlooks, rest areas and rehabilitation of historic transportation related buildings such as train stations.

All Federal-aid special transportation programs such as TE projects involving pedestrian accessibility must include current applicable pedestrian accessibility facilities whether or not the project is located within the public right-of-way. The 2010 ADA Standards include special guidelines for building alterations and historic preservation projects.

b. Highway Occupancy Permits. The need to provide new or additional pedestrian access along and across existing highways as a result of new adjacent property development must require the approval and issuance of a PennDOT Highway Occupancy Permit (HOP) to the local government or adjacent property owner. The HOP may include the requirement that ADA compliant pedestrian facilities be made a part of the permit conditions.

The permittee shall be responsible to continuously maintain the facilities including curbs, sidewalks and curb ramps so as to conform to the permit and so as not to interfere or be inconsistent with the design, maintenance, and drainage of the highway, or the safe and convenient passage of traffic upon the highway. Curb ramps are an integral part of the entire sidewalk system.

For ADA facilities in PennDOT ROW, PennDOT should complete, or verify the completed, Curb Ramp Inspection Forms (CS-4401) and approve the Technically Infeasible Forms for all ADA Curb Ramps and pedestrian facilities that are appurtenant and integral to the function and operation of driveways / local roads where they intersect the State Route. If ADA facilities are located outside PennDOT ROW and are deemed integral to the function / operation of a driveway / local road at the intersection of a State Route, the HOP applicant should prepare and submit any Technically Infeasible Forms for ADE approval.

This includes all curb ramps crossing State Routes, curb ramps crossing local roads at the intersection of State Routes, and curb ramps constructed as part of commercial / residential / industrial driveways that provide access to or from State Routes.

Pedestrian facilities that are not appurtenant and integral to the function of driveways / local roads do not require PennDOT approval or oversight. When permit plans indicate the construction of any pedestrian facilities, the following note should be included on the plans.

"CONSTRUCT ALL PROPOSED PEDESTRIAN FACILITIES ON THESE PLANS TO COMPLY WITH THE AMERICANS WITH DISABILITIES ACT, PUBLIC RIGHT-OF-WAY ACCESSIBILITY GUIDELINES (PROWAG), AND THE 2010 ADA STANDARDS."

Appropriate accessibility guidelines, construction standards and specifications or other approved construction details must be used in the preliminary and final design stages of all projects to ensure accessibility facilities are constructed where required in the project.

2. Minor Alteration Projects. Minor or Betterment alteration projects can affect access, circulation, or use of existing facilities within the existing right-of-way. Minor or Betterment Projects that could affect existing pedestrian access and trigger the need for installation of or upgrading of accessibility facilities are listed below.

- Milling, resurfacing, restoration, rehabilitation and reconstruction for pavement improvements and widening, intersection improvements and utility adjustments
- Roadway signalization – Placement of poles and control panels
- Pedestrian signalization – Placement of poles and control panels
- Signing – Placement of poles or posts
- Roadway lighting – Placement of poles, junction boxes and control panels
- Construction of grade separation structures – Overpasses and underpasses
- Rehabilitation or replacement of any length bridge structure
- Shoulder rebuilding and widening – Adjoining or part of a pedestrian access route
- Inlet replacement – Inlet locations affecting pedestrian routes
- Guide rail replacements – Adjoining or part of a pedestrian access route
- Fringe parking areas – Parking and pedestrian circulation
- Safety rest areas and welcome centers – Work affecting parking and pedestrian circulation
- Transportation Enhancements – Projects relating to public use of highway facilities and streetscapes

Resurfacing is an alteration that improves the vehicular paths of the roadway. It is also an alteration to pedestrian paths that cross the altered roadway; therefore the pedestrian paths must be upgraded to the latest ADA requirements. A federal court case ruled the curb ramps at the end of the altered pedestrian path must also be considered altered and must be upgraded. Source: *Kinney v. Yerusalim*, 9 F.3d 1067 (3d Cir. 1993), cert. denied, 511 U.S. 1033 (1994).

These minor alteration projects are general examples only and each operation must be assessed individually in relation to any existing pedestrian accessibility feature.

3. Non-alteration Projects. Minor or Betterment Projects that in all likelihood will not affect access, circulation, or use of existing facilities within the existing right-of-way are listed below:

- Truck escape ramps
- Guide rail removal or replacement not affecting pedestrian access routes
- Roadside slope flattening
- Pavement markings and line striping
- Shoulder rebuilding in areas not affecting pedestrian access routes
- Signal maintenance / signal head replacement
- Sign maintenance / replacement
- Roadway lighting maintenance including luminaire and bracket arm replacements
- Truck weigh stations
- Wetland replacement mitigation
- Safety hardware upgrades
- Drainage – replacement of manholes, endwalls, pipes, culverts and inlets not affecting pedestrian access routes
- Bridge painting

Normal maintenance activities are not considered alterations and do not require simultaneous improvements to pedestrian accessibility under the ADA. Maintenance activities include actions that are intended to preserve the roadway system, retard future deterioration and maintain the functional condition of the roadway without increasing the structural capacity. Maintenance activities can include seal coats, slurry seals, and other

preventive maintenance items such as crack sealing / joint repair, pavement / pothole patching, shoulder repair, repair to drainage systems, emergency repairs and pipe cleaning.

4. Technically Infeasible. All construction must meet PennDOT's standards. For existing sites where it is technically infeasible to construct facilities fully to current PennDOT's standards, as determined by using sound engineering judgment, a "Technically Infeasible Form" documentation must be prepared. This must be submitted and approved before construction to document that access has been designed to the maximum extent feasible. The Technically Infeasible Form (similar to a design exception) must include the following:

- Project site constraints that would adversely affect installing the appropriate access feature
- Reasons why the access feature cannot be designed to the desired standards
- The design solution derived to provide access to the maximum extent feasible

Project site constraints may include but are not limited to:

- Limited right-of-way
- Existing utilities
- Existing buildings, walls or vaults
- Environmental impacts
- Historic impacts
- Safety
- Roadway profile slope

Project scope, not cost, will determine when existing site constraints justify the use of the Technically Infeasible Form. In certain situations, existing site constraints may justify the use of a design that provides access to the maximum extent feasible if removing the existing site constraints would require additional work that is not included as part of the project scope. For example, a resurfacing project may not include removal of existing site constraints in the project scope and may be justification for installing a facility that provides access to the maximum extent feasible. However, for a widening project that includes right-of-way acquisition, utility relocations and removing underground vaults as part of the project scope, these constraints will not be satisfactory justification for installing a facility that does not meet PennDOT's standards since they are part of the project scope. The existing site constraints must be evaluated on a case-by-case basis using sound engineering judgment before submitting a Technically Infeasible Form.

a. Technically Infeasible Scenario #1. For an overlay project, the designer suggests that an existing Type 1 curb ramp without a landing provides the maximum access possible since the curb ramp is located within limited right-of-way and is part of a narrow sidewalk. In this situation the designer is incorrect. A Type 2 curb ramp may be installed and provide full access, the Type 1 curb ramp design is not appropriate because the level of access can be improved. The Type 2 curb ramp must be installed to provide access fully meeting the standards.

b. Technically Infeasible Scenario #2. For an overlay project, the designer suggests that an existing Type 2 curb ramp with a ramp slope of 1V:10H (10.00%) provides the maximum access feasible after evaluating all possible design alternatives within the project scope. The existing site constraints included narrow sidewalk width and limited right-of-way. In certain situations the designer may reach the conclusion that a curb ramp cannot be improved without going beyond the project scope and may not be required to upgrade the facility. For this scenario it is important to evaluate if the facility is accessible. The 1V:10H (10.00%) curb ramp slope is greater than the maximum curb ramp slope but still provides a general accessible solution.

c. Technically Infeasible Scenario #3. For an overlay project, the designer suggests that an existing Type 1 diagonal curb ramp should be replaced with a Type 4A curb ramp with a slope slightly exceeding the standards due to limited sidewalk width. An evaluated alternative that included the installation of two fully compliant Type 2 curb ramps was dismissed by the designer because it required the adjustment of an existing electric box where one of the curb ramps would be placed. In this situation, utility adjustments are not part of the project scope. However the utility adjustment would not have a major impact on the

project and is not suitable justification for installing a curb ramp that does not fully meet the standards. Relocating existing utilities, obtaining right-of-way, or performing other out-of-scope work in order to fully meet the standards must be evaluated on a case-by-case basis.

d. Technically Infeasible Scenario #4. For an off-alignment project, the designer suggests that an existing Type 1 curb ramp without a landing provides the maximum access possible due to proposed utility locations and limited right-of-way. New construction projects are held to the highest degree of PennDOT's standards since the project scope provides the greatest flexibility to provide accessible facilities. In the above scenario, the site constraints listed are part of the project scope and are not valid. Additional right-of-way or alternate placement of proposed utilities will be required to meet PennDOT's standards.

The Technically Infeasible Form will be reviewed prior to construction by the District ADA Review Committee. It is recommended that the District ADA Review Committee have the following members or disciplines: Traffic, Bike/Pedestrian Coordinator, Safety, Maintenance, and Community Relations Coordinator. The District ADA Review Committee will make a recommendation for approval to the ADE of Design or delegate. Once approved by the ADE of Design or delegate, the Technically Infeasible Form will be submitted as part of the contract documents. For Design/Build projects, the Technically Infeasible Form will become part of the contract documents upon approval. The District will be responsible for maintaining a copy of all Technically Infeasible Forms. An electronic copy must be sent to the ADA Coordinator at Central Office where the data will be archived into a database.

See [Chapter 6, Appendix A, Technically Infeasible Form](#), for additional information.

C. Unaltered Existing Facilities. As per the Title II requirements under the ADA, existing facilities and programs, even though they have not been altered, must not deny access to persons with disabilities. A range of methods are available to ensure that people who have disabilities are not denied access to public facilities and programs. In many situations, an operational solution may achieve program accessibility without the need for construction.

In fact, existing facilities do not have to be made accessible if other methods of providing access are effective. Except for the installation of curb ramps, which are specifically required for program access, structural changes are an option of last resort.

A pedestrian circulation system (sidewalks, street crossings, shared-use paths in the public right-of-way) is a facility that a local government provides for its citizens. It is the general availability of this facility to people with disabilities that must be evaluated when considering the existing pedestrian environment. Full compliance with facility standards developed for new construction and alterations may not be required to achieve access.

Facility accessibility can be thought of as providing a basic level of usability. It targets high-priority access improvements (curb ramps) that eliminate major barriers to the use of existing facilities, so that people with disabilities are not excluded from participation. Program accessibility requires careful planning to identify those efforts that will provide the greatest access to the available resources. Non-construction approaches may include alternate accessible routes, relocation of services or activities to accessible locations, or providing the service or benefit directly to the individual.

Jurisdictions should consider whether such operational solutions would be sustainable over the long term. For some rights-of-way elements, structural changes may be more economical. In an existing right-of-way that is not otherwise being altered, the minimum requirement for achieving program accessibility is the installation of curb ramps at selected locations where existing pedestrian walkways cross curbs. This work must be identified in the transition plan.

6.3 PROJECT TYPE EXAMPLES

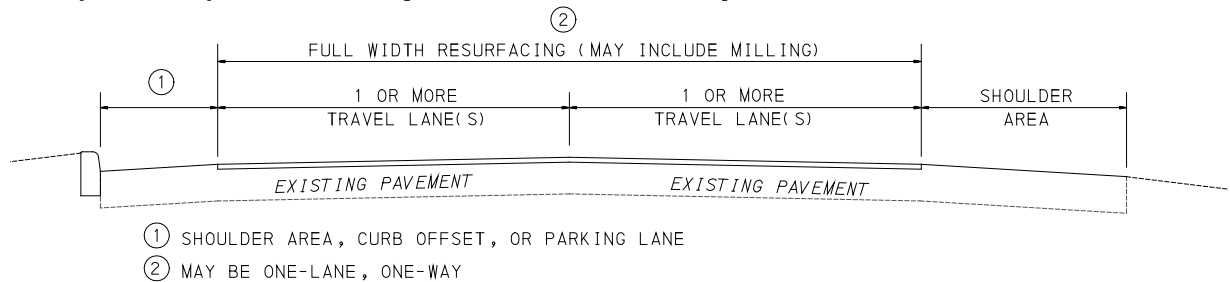
A. Maintenance Type Projects. The following examples represent projects that include routine maintenance and repair work that generally does not impact, disturb or modify pedestrian usability. Note: Resurfacing projects are not considered routine maintenance and are not represented with the following examples.

- Repair of drainage pipes or inlets that result in a small portion of sidewalk being removed and replaced. This type of work will require only that the sidewalk be repaired in-kind and no additional installation / upgrade of sidewalk or curb ramps would be required. However this project would not be considered a maintenance type project if a significant length (equal to or greater than 30 m or 46 m² (100 ft or 500 ft²)) of sidewalk is removed.
- Utility repairs or relocations that result in a small portion (less than 30 m and less than 46 m² (less than 100 ft and less than 500 ft²)) of sidewalk being removed and replaced would require only repair in kind and would not trigger any new installation or upgrades to existing sidewalk or curb ramps. The placement of utilities may not decrease the accessible path width to less than 1220 mm (4 ft).
- Repair of damaged traffic barrier adjacent to sidewalk in an urban area would not require upgrade of the adjacent sidewalk or curb ramps.
- Repair of potholes, spot patching of roadway or crack sealing of roadway would not require any installation or upgrades to adjacent sidewalks or curb ramps.
- Modifications to existing traffic signals (non-structural) such as repair, replacement and maintenance of traffic signal head modules, pedestrian signal head modules, loop detectors, video detectors, microwave detectors, signal controller features, wiring, junction boxes, traffic control signage, roadway lighting or cameras would not require any installation or upgrades to adjacent sidewalks or curb ramps. However, if the modification creates a negative impact to the existing sidewalk or existing pedestrian push buttons are not accessible, improvements or upgrades must be installed.
- Re-striping or modifications to the pavement markings on a roadway would not require installation or upgrade of existing sidewalk or curb ramps. If new striping is installed to designate a crossing to curbs without curb ramps at the crossing, it will be necessary to install curb ramps.
- Spot patching or repair of existing sidewalk to correct buckling, cracking or other severely deteriorated conditions would not require installation of new or upgrade of existing sidewalk. However, as a rule of thumb, if more than 50% of a run of sidewalk is being repaired, the entire length should be upgraded to PennDOT's standards. This work may include installing or upgrading curb ramps.
- Slurry seals to correct surface friction or seal entire roadway to address cracking would not require upgrade of the curb ramps. These applications must be feathered into the curb ramp to provide a flush transition.
- Emergency repairs would not require upgrade or installation of curb ramps. Emergency repairs include interim pavement patching or thin overlays for severely distressed pavement due to a harsh winter, natural or man-made disasters.
- Traffic signal timing modifications, repair or maintenance of pedestrian pushbuttons and the addition or modification of a closed loop system would not require modifications to meet PennDOT's standards.

B. Alteration Type Projects. The following projects include alterations that affect pedestrian usability. That is, when an existing element is replaced, it must either meet current PennDOT's standards or have an approved Technically Infeasible Form for any element that does not meet full compliance. The work does not require any additional work beyond the altered facilities; however, it may be beneficial to upgrade other unaltered pedestrian facilities as part of the project to improve access. Resurfacing is considered an alteration. Examples of Alteration Type Projects include:

- A resurfacing project, including maintenance resurfacing, affects the usability of pedestrian paths that cross the resurfacing area. This alteration project must install new curb ramps where any pedestrian route crosses a curb and upgrade existing curb ramps to the latest PennDOT standards. Provide access to pedestrian push buttons to the maximum extent feasible. The resurfacing project would not require the existing sidewalks or driveways within the limits of the project to meet PennDOT's standards since the sidewalk and driveways are not altered as part of the project.
- When utility or roadway maintenance work such as mechanized patching requires the resurfacing of the full width of the roadway and that resurfacing goes through a Pedestrian Accessible Route (PAR), it is considered an alteration and the curb ramps on both ends of the PAR must be in compliance with ADA standards to the maximum extent feasible. Full width of the roadway is defined as the outside travel lane edge to outside travel lane edge. See figure below.

When utility or roadway maintenance work requires resurfacing of one or more travel lanes, but not the full width of the roadway, and the resurfacing does not extend the pavement lifecycle, curb ramp upgrades will not be triggered. Documentation should be put into the file indicating the pavement resurfacing schedule has not been affected due to the lane resurfacing required by the utility or roadway maintenance work. Adjusting the utility or roadway maintenance work resurfacing requirements or other utility or roadway maintenance scopes of work to avoid ADA requirements is not allowed.



- A signal project includes installing a new signal pole and push buttons on one corner of an intersection. Part of a curb ramp flare must be sawcut and removed in order to install the signal pole foundation. The installation of a signal pole is an alteration to the pedestrian push button but not an alteration to the sidewalk or street even though a small portion of the curb ramp is impacted and therefore the curb ramp does not need to be upgraded as a part of this project. If the pole is placed where it has a negative impact on the pedestrian access route, the negative impact must be addressed.
- A signal project included removing an existing signal pole, installing a new signal pole and installing push buttons on one corner of an intersection. The corner of the intersection has sidewalk but is missing a curb ramp. The installation of the pedestrian push button and signal pole is not an alteration to the sidewalk or street; however, PennDOT may not deny access to the push button and must provide access to the push button.
- Traffic signal mast arm modifications/relocations, addition/upgrade/relocation of the pedestrian detection system (push buttons, audible system, etc.), addition of a new pedestrian signal system that was not previously incorporated into the intersection, lane widening that modifies the existing pedestrian system (relocation of pedestrian poles, timing modifications, etc.) are all alterations that would require the altered facility to meet PennDOT's standards.
- A utility company decides to relocate its utility lines underground, requiring the reconstruction of a substantial length [equal to or greater than 30 m (100 ft)] of existing sidewalk. The newly constructed sidewalk will need to meet PennDOT's standards. The limits of the sidewalk to be replaced must be extended to meet logical termini. Curb ramps must be installed or upgraded and must be provided at all street crossings and signalized entrances unless a pedestrian study determines accommodations are not warranted. The limits will be determined by the Assistant District Executive (ADE of Design, ADE Services, or their designate using sound engineering judgment, considering factors such as ownership of

the sidewalk, degree of impact, complexity of the solution and overall project scope. If the work disturbs 50% or more of the sidewalk width and the limit of sidewalk reconstruction is within 15 ft of a pedestrian crossing, curb ramp upgrades will be required for that corner or mid-block crossing. For projects over 300 ft, if a pedestrian crossing or curb ramp is within 5% of the total disturbed length of sidewalk, curb ramp upgrades will be required for that corner or mid-block crossing. For example, a 572 ft sidewalk disturbance would be required to extend 28.6 ft to upgrade a crosswalk or install a required crosswalk. The measurement will be from the end of disturbance to the edge of the existing (or missing) landing or ramp or crosswalk line.

- Striping (not restriping) of a crosswalk improves the pedestrian crossing and is an alteration. Alterations to the pedestrian path must also upgrade curb ramps at the crossing.
- Minor widening or geometric improvements are being made to a non-curbed section of roadway in a rural area with no evidence of existing pedestrian activity (i.e., worn dirt paths, visual observation of people walking in roadway, adjacent bus stops, adjacent pedestrian destinations such as schools or shopping centers, etc.). The project would not require the installation of new sidewalks if it is not within a designated growth area or if a pedestrian study does not support the need.
- A substantial section of sidewalk is to be reconstructed under an area-wide sidewalk contract. The entire section will be required to be replaced to PennDOT's standards. The sidewalk must extend to logical termini. As a rule of thumb, if more than 50% of a run of sidewalk is being replaced, the entire length should be upgraded to PennDOT's standards.

C. Reconstruction and New Construction Type Projects. The following projects are typically major projects including new construction, reconstruction, retrofit projects, sidewalk retrofit projects and community enhancement projects. These projects will be held to the highest standards regarding pedestrian usability and ADA compliance. A Technically Infeasible Form will be required for any reconstructed pedestrian facility that does not meet PennDOT's standards. Technically Infeasible justification may only be applied to New Construction in very limited circumstances. These projects must evaluate the need for pedestrian circulation paths, including PAR's between logical termini. Pedestrian needs should be evaluated in the planning phase (Pre-TIP), refined and/or reevaluated in scoping and preliminary engineering. Coordination with the local municipality is critical to this process.

- New construction or reconstruction of a curbed roadway must evaluate adding new or upgraded sidewalks and curb ramps to PennDOT's standards at all street crossings and signalized entrances.
- New construction or reconstruction of a bridge in an urban area or an area with evidence of existing pedestrian activity (i.e., worn dirt paths, visual observation of people walking in roadway, adjacent bus stops, adjacent pedestrian destinations such as schools or shopping centers, etc.) must evaluate adding new or upgraded sidewalks and curb ramps to PennDOT's standards.
- A community enhancement project must evaluate including new sidewalk or improve the existing sidewalk and curb ramps to PennDOT's standards within the project limits and extending the limits to logical termini. If aerial utilities are to be moved to support the project, they must be either relocated entirely outside of the new sidewalk or, if necessary, within the sidewalk (last resort) outside of the PAR where they will not become obstructions to ensure access for all pedestrians to the maximum extent possible.
- A park and ride lot or an expansion to an existing park and ride lot must evaluate providing or upgrading sidewalks and curb ramps that meet PennDOT's standards to access adjacent sidewalks, bus stops or transit stations. When transit loading areas are within the park and ride lot, they must meet the requirements of the proposed 2011 PROWAG.
- When it is determined through a pedestrian study that sidewalk is to be included in the project scope, the municipality will be responsible for future maintenance. A sidewalk maintenance agreement must be signed or sidewalk will not be installed or reconstructed. See [Section 6.6](#).

- Minor widening or geometric improvements are being made at an intersection with curb, but no existing sidewalk. If a pedestrian study determines there is a need to accommodate pedestrians (i.e., local or regional plans, worn dirt paths, visual observation of people walking in roadway, adjacent bus stops, adjacent pedestrian generators and attractions such as schools or shopping centers, etc.) new sidewalk meeting PennDOT's standards should be evaluated for construction in the area of the widening and extend to logical termini. Curb ramps must also be installed or upgraded where pedestrian paths cross curbs.
- A resurfacing project includes the addition of new sidewalk within the project limits. All new sidewalk and curb ramps within the project limits must meet PennDOT's standards.
- A developer widens the roadway to provide an auxiliary lane. As a result, the existing sidewalks are impacted. The developer must replace the impacted sidewalk along their frontage, and may need to replace the remaining pedestrian facilities within the project limits to PennDOT's standards.
- A developer wants to modify their existing access onto PennDOT right-of-way. There currently is no sidewalk along the property frontage and there is evidence of existing pedestrian activity and/or existing sidewalk along the frontage of adjacent businesses. The developer must install curb ramps meeting PennDOT's standards at all street crossings and signalized entrances along the property frontage. The developer may be required to install new sidewalk along the property frontage and extend the improvements beyond the frontage to logical termini in accordance with municipal ordinance to provide pedestrian continuity and connectivity.
- New construction or reconstruction of shared use paths must meet PennDOT's standards, which includes providing curb ramps wherever a trail crosses a curb.
- Placement of a new signalized intersection or complete upgrade of an existing signalized intersection must meet PennDOT's standards.

D. Connections to Existing Facilities. All construction must meet PennDOT's standards. At the limits of the project or limits of construction, connections to the existing sidewalk or other facilities will be required. At these tie in locations, deviation from the standards may be necessary to match the existing facility. For example, as part of a curb ramp upgrade, a small portion of sidewalk has been reconstructed at a width equal to 1525 mm (60 in). The existing sidewalk width is equal to 915 mm (36 in) at the tie in location. In this example the sidewalk width will transition from the proposed width to the existing width. See Publication 72M, *Roadway Construction Standards*, RC-67M for Transition to Existing Sidewalk Detail. A Technically Infeasible Form is not required for transitions required to connect to existing facilities.

6.4 LIAISON WITH LOCAL GOVERNMENT AND PRIVATE PROPERTY OWNERS

Maintaining the proper liaison with local governments and school districts concerning the installation and funding of accessibility facilities is an important part of this policy. Local governments must be kept informed of any adjacent roadway project scope of work that entails accessibility facilities that may affect their facilities or require their participation in funding or maintenance responsibilities.

A. Americans with Disabilities Act: Reimbursement and Maintenance for Curb Ramps with Local Municipalities. Resurfacing projects, including overlay, wearing course resurfacing and mill and fill projects, are considered an alteration to the roadway and to any pedestrian path that is crossed. As per Title II requirements under the ADA, when a facility is altered, the facility must meet the current standards. A federal court decision (Kinney v. Yerusalim, 1993) determined the pedestrian crossing and the curb ramps are to be considered as a single unit. Therefore, when the pedestrian crossing is altered, the curb ramp is also considered altered and must be reconstructed or upgraded to meet the current standards by the entity performing the alteration. If PennDOT performs the resurfacing project or impacts the pedestrian path, PennDOT is ultimately responsible to see that all curb ramps meet the current PennDOT standards.

Coordination must be completed with the local municipality to discuss financial and maintenance responsibilities.

1. 100% Federal Funded Projects.
 - PennDOT will not seek any reimbursement from the municipality.
2. 100% State Funded Projects.
 - Pedestrian facilities that provide access across state routes – PennDOT will fully fund.
 - Pedestrian facilities that provide access across local roads – Municipality will fully fund.
 - Pedestrian facilities that provide access across both state routes and local roads – 50/50 cost sharing.
3. Federal State and Local Funded Projects.
 - Each party will be responsible for their percentage of the total project cost.
 - o See [Chapter 6, Appendix B](#), for Charts 1-6, funding scenarios.

As per State Highway Law of 1945, local municipalities will be responsible for maintaining all structures located outside of the curb lines. A maintenance agreement will be required for all sidewalk installation and replacement projects, except projects performed under an HOP. The maintenance agreement process is to be completed in the design phase of the project, prior to advertising. Maintenance agreements will not be required for installation or replacement of curb ramps and/or level landings where such installation or replacement is done to provide ADA compliant facilities.

According to the State Highway Law of 1945, Sections 502, 513, 522 and 542, the Secretary of Transportation has determined that the Department will perform roadway maintenance between curblines and will not perform maintenance for pedestrian structures such as, but not limited to, curb, sidewalks, curb ramps and level landing areas. This includes level landings providing access to pedestrian pushbuttons. These pedestrian structures located outside of the curb lines will be maintained by municipalities. The only exceptions to this allocation of maintenance responsibilities are those set forth specifically by agreement [or for such structures on bridges maintained by the Department].

Curb ramps and level landings are portions of the sidewalk system that provide ADA compliant pedestrian accessibility across the roadway and to pedestrian pushbuttons. Curb ramps and level landings are installed pursuant to ADA requirements, not Section 670-416 of the State Highway Law.

With respect to sidewalk installation or replacement projects, if a municipality chooses not to sign the maintenance agreement, the Department can (a) cancel the project; (b) reduce the scope of work for the project, or (c) program a project in another municipality that is willing to sign the agreement. As part of the cooperation, a local government or group of local governments may choose to meet with the Department to map out long range plans.

A series of coordination letters and a reimbursement and maintenance agreement has been developed to expedite coordination with municipalities (See [Chapter 6, Appendix C](#)). The municipality has several methods of reimbursement:

1. The municipality must make payment to the Commonwealth in full within thirty (30) days of receipt of such invoice.
2. The municipality, after receipt of such invoice, must make monthly payments to the Commonwealth for a period of one (1) year. The payments must be in equal amounts and total all costs.
3. The municipality must make payment to the Commonwealth in full after receiving the necessary funds from a Pennsylvania Infrastructure Bank (PIB) loan. The municipality must make payment to the Commonwealth in full within thirty (30) days of receipt of such loan, which must be no longer than sixty (60) days after completion of the Project.
4. The municipality authorizes the Commonwealth to withhold and apply a portion of the municipality's Liquid Fuels Tax Fund allocation as necessary to reimburse the Commonwealth in full for all costs.

Should municipalities choose not to participate in funding their curb ramps, the Department will adjust the project limits of work. The Department will address curb ramps along state routes only and adjust milling and resurfacing operations to follow along the face of curb thereby not impacting the curb ramps along the local roads. In some

cases it will be necessary to upgrade the curb ramps along the local road in order to correctly upgrade the curb ramps along the state route. If the municipality chooses not to participate in funding curb ramps, the Department will fund the local curb ramps in order to comply with ADA regulations.

B. Installing Curb Ramps Located Outside of the Public Right-of-Way. The acquisition of right-of-way for the construction of curb ramps is dependent on the scope of work for the project. If the project scope includes right-of-way acquisition, then right-of-way must be acquired where applicable for curb ramp construction. However, if the project scope does not include right-of-way acquisition, then right-of-way will not be acquired for curb ramp installations. The following should be noted:

1. PennDOT typically does not have maintenance responsibility beyond the face of curb but still may have right-of-way that extends beyond the face of curb.
2. Municipal right-of-way is public right-of-way. Curb ramps and other pedestrian facilities may be installed or upgraded within the municipal right-of-way.

For sidewalk or curb ramp construction on private property (sidewalk area is in public use and project scope that does not include right-of-way acquisition), perform the following coordination with the property owner:

1. Send initial certified letter (Authorization to Enter Introduction) to the property owner explaining the scope of the project and the affect on their property. See [Chapter 6, Appendix D](#), Attachment A. Include Form RW-397A, Authorization to Enter (Waiver of Claim).
2. Set up an appointment with the property owner and **PennDOT personnel** to have property owner sign off on Form RW-397A, Authorization to Enter (Waiver of Claim).
3. Outcome 1. Property owner signs Form RW-397A, Authorization to Enter (Waiver of Claim).
 - Construct curb ramp to current standards.
4. Outcome 2. Property owner refuses to sign Form RW-397A, Authorization to Enter (Waiver of Claim).
 - Send a second certified letter (Authorization to Enter Failure to Respond) notifying the property owner of their liability. See [Chapter 6, Appendix D](#), Attachment B.
 - Depending on available right-of-way:
 - Install new or upgrade existing curb ramp to the maximum extent feasible.
 - Do not install new or upgrade the curb ramp, and add the existing curb ramp to the ADA Transition Plan to be addressed in the future.
 - Document that authorization to enter has been denied from the property owner (with the Technically Infeasible Form).

6.5 PEDESTRIAN ACCESS ROUTE

The pedestrian access route (PAR) as defined by PROWAG is a continuous and unobstructed walkway within a pedestrian circulation path that provides accessibility. Pedestrian accessible routes may include parking access aisles, curb ramps, crosswalks at vehicular ways, walks, ramps, roadway shoulders, water table on bridge decks, and lifts. The following sections will discuss many of these facilities separately; however, these facilities share the common requirements of the PAR.

A. PAR General Requirements.

1. Surface Requirements. The surface must be stable and firm with a slip resistant textured finish. A standard test has not been identified for measuring slip resistance; therefore sound engineering judgment must be used in the determination.
2. Elevation Differences. For elevation differences located within the PAR (excluding depressed curb for curb ramps) existing changes in level up to 6.4 mm (0.25 in) in height may remain without any edge treatment. Changes in level greater than 6.5 mm (0.25 in) and less than or equal to 13 mm (0.5 in) height must be beveled

with no slope greater than 1V:2H (50.00%). Changes in level greater than 13 mm (0.5 in) height must be accomplished by means of a sloped surface such as a ramp or curb ramp.

3. Grate Openings and Horizontal Gaps.

a. Expansion Joints. The use of expansion joints should be minimized and their size should be less than 13 mm (0.5 in) in width. Expansion joint material is required where the curb ramp adjoins any rigid pavement, sidewalk, curb or structure. The top of the joint filler must be flush with the adjacent concrete surface.

b. Inlet Grates. Inlet grates located within the pedestrian access route must have spaces no greater than 13 mm (0.5 in) wide in one direction. If gratings have elongated openings, then they must be placed so that the long dimension is perpendicular to the dominant direction of pedestrian travel.

4. Longitudinal Slopes. The least possible slope must be used for the PAR. The maximum desirable slope is 1V:20H (5.00%); however, when the PAR is located within the public right-of-way, including vehicular bridges, the longitudinal slope may match the adjacent roadway profile slope. It may be necessary to temporarily exceed the roadway profile when crossing driveways or providing curb ramps. Where an overpass, underpass, bridge, or similar structure is designed for pedestrian use only and the approach slope to the structure exceeds 5 percent, a ramp, elevator, limited use/limited application elevator, or platform lift shall be provided. Elevators and platform lifts shall be unlocked during the operating hours of the facility served.

5. Cross Slopes. Cross slopes may not exceed 1V:50H (2.00%). The cross slope of curb ramps, blended transitions, and turning spaces shall be 2 percent maximum. At pedestrian street crossings without yield or stop control and at midblock pedestrian street crossings, the cross slope shall be permitted to equal the street or highway grade. See 2011 PROWAG R304.5.3 for more information.

6. Unobstructed Width. Minimum unobstructed widths of 1220 mm (48 in) provide the necessary room for pedestrians using wheelchairs. This is consistent with PROWAG and exceeds the 2010 ADA Standards minimum clear widths of 915 mm (36 in). See [Figure 6.1](#).

Note: The 2010 ADA Standards allow for a 915 mm (36 in) minimum clear width with provisions to allow an 815 mm (32 in) clear width if the obstruction (such as a street sign) is less than 610 mm (24 in). The Department's standards exceed this width. Appropriate application of the 2010 ADA Standards minimum clear width is acceptable in determining if existing facilities are accessible.

a. Protruding Objects. Refer to [Figure 6.3](#). Objects projecting from walls such as signs, telephones, canopies, etc. with their leading edges between 685 mm and 2030 mm (27 in and 80 in) above the finished sidewalk must protrude no more than 100 mm (4 in) into any portion of a sidewalk ([Figure 6.3\(a\)](#)). Objects mounted with their leading edges located less than 685 mm (27 in) or more than 2030 mm (80 in) above the finished sidewalk may project any amount provided they do not reduce the required continuous passage along the sidewalk ([Figures 6.3\(a\) and \(b\)](#)). Free standing objects mounted on posts may overhang their mountings a maximum of 305 mm (12 in) when located between 685 mm and 2030 mm (27 in and 80 in) above the ground or finished sidewalk provided they do not reduce the required continuous passage along the sidewalk ([Figures 6.3\(c\) and \(d\)](#)). Note: The 2010 ADA Standards and PROWAG depict overhead clearance as 2030 mm (80 in); **however, refer to the MUTCD for traffic signal mounting requirements.**

b. Headroom. Guide rail, handrail or other barriers must be provided when the vertical clearance of an area along or adjoining a sidewalk or continuous passage is less than 2030 mm (80 in) high. The leading edge of such barriers must be located a maximum of 685 mm (27 in) above the finished sidewalk ([Figures 6.3\(a\) and \(c-1\)](#)).

7. Landing Requirements.

a. Size. A minimum 1220 mm × 1220 mm (48 in × 48 in) landing must be provided where pedestrians perform turning maneuvers or require resting areas. When the turning area is confined by walls, curbs or

other obstructions, the landing must be 1525 mm × 1525 mm (60 in × 60 in). See [Figure 6.2](#) for the 2010 ADA Standards wheelchair turning space requirements for confined spaces.

b. Slope. The surface slope of the landing must not exceed 1V:50H (2.00%) in longitudinal slope or cross slope.

8. Detectable Warning Surfaces (DWS). The PAR must also have a standardized detectable warning surface comprised of truncated domes as detailed in Publication 72M, *Roadway Construction Standards*, RC-67M. For pedestrians with vision impairments, detectable warnings can provide a confirming cue of the street edge. Normally the DWS is installed as part of a curb ramp; however, a DWS must be installed where the PAR crosses streets, alleys or railroads. Detectable warning surfaces should not be provided at crossings of residential driveways since the pedestrian right-of-way continues across residential driveway aprons. However, where commercial driveways are provided with yield or stop control, detectable warning surfaces should be provided at the junction between the pedestrian route and the vehicular route. DWS must be bid as "either/or" items. The contractor can choose from any of the product types listed in Publication 35, *Approved Construction Materials* (Bulletin 15). Requests to use a specific type must be approved by the Bureau of Project Delivery, Highway Delivery Division, Project Schedules, Specifications and Constructability Section.

a. Contrast. Many colors are available for the DWS. It is recommended that the color selection is coordinated with in-place DWS. The DWS must contrast light-on-dark or dark-on-light. Currently a standard test has not been defined to measure the contrast; therefore, contrast must be determined using sound engineering judgment.

b. Dome Arrangement. The domes must be aligned in parallel and perpendicular rows and columns in relation to the edge of the tile or unit. This dome arrangement allows the truncated domes to be installed in the direction of the PAR, path of the wheelchair travel and perpendicular to the grade break at the toe of the ramp or curb ramp. This will provide pedestrians using wheelchairs the ability to maneuver between the domes rather than travelling over them. Older versions of the truncated domes are arranged in diagonal rows in relation to the edge of the tile or unit. This older configuration is still detectable as a warning surface for existing in-place applications, but should not be used for future construction.

c. DWS in Roadway Shoulders. Roadway shoulders are designed and constructed to support the roadway and, as a general rule, are not constructed as a PAR and are not required to comply with ADA requirements. DWS should not be installed in the shoulder. At intersections without sidewalks, connecting trails, or other accessible pedestrian circulation paths systems, marked or unmarked crosswalks to shoulders do not require DWS in the shoulder. In the rare case the shoulder is intended to be a PAR, it should be constructed with a 2% cross slope and DWS will be required in the shoulder at crosswalks. Central Office ADA Coordinator approval is required for construction of shoulders as a PAR. See [Section 6.5.B.4](#).

d. Pedestrian Pushbutton Access. Ramps and level landings to access pedestrian pushbuttons, located behind the shoulder, will still have DWS. DWS should be placed in the ramp or level landing, outside the shoulder, at the back edge of the shoulder. Intersection raised islands that intersect a crosswalk are considered barriers to access and require curb ramps and DWS.

e. At cut-through pedestrian refuge islands, detectable warning surfaces shall be placed at the edges of the pedestrian island and shall be separated by a 610 mm (2.0 ft) minimum length of surface without detectable warnings. Detectable warning surfaces are not required at pedestrian refuge islands that are cut-through at street level and are less than 6.0 ft in length in the direction of pedestrian travel. Where a cut-through pedestrian refuge island is less than 6.0 ft in length and the pedestrian street crossing is signalized, the signal should be timed for a complete crossing of the street.

B. PAR Miscellaneous Requirements.

1. Algebraic Grade Difference. The algebraic grade difference between any two surfaces, such as the road surface and curb ramp, must not exceed 13.33%. Where the algebraic grade difference exceeds 13.33%, a 610 mm (24 in) transition strip must be used to create a more gradual change in grade. Transition strip slope

must not exceed 1V:20H (5.00%). See Publication 72M, *Roadway Construction Standards*, RC-67M for details.

2. Driveway Aprons. This information will supplement the information presented in [Chapter 7, Driveways](#). Excessive cross slope on driveway aprons can be a significant barrier for pedestrian use. A level area with minimal cross slope is necessary for accessible passage across a driveway. Driveway aprons that are constructed like ramps, with steep, short side flares, can render a section of sidewalk impassable, especially when encountered in series, as in residential neighborhoods. Compound cross slopes, such as those that occur at the flares of a driveway apron or curb ramp, may cause tipping and falling if one wheel of a wheelchair loses contact with the ground or the tip of a walker or crutch cannot rest on a level area. Even with narrow sidewalks along the curb, it is possible to design a sidewalk to pass across the driveway apron without exceeding a cross slope limitation of 1V:50H (2.00%). Sidewalks that cross multiple driveways that are close together can create a rollercoaster effect as the sidewalk ramps up and down to cross the driveways. Consider keeping the top of sidewalk at driveway elevation until all driveways have been crossed. Another option is to use a reduced height sidewalk between driveways while trying to keep the ramp slopes under 5%, with 8.33% as a maximum. See [Chapter 7, Driveways](#).

3. Utilities. Existing utilities, such as electric boxes, manholes, inlets, fire hydrants and electric poles, may remain in the PAR given the utility meets the previously mentioned requirements. Proposed utilities should be placed outside of the PAR where feasible or at a minimum where they do not obstruct the PAR.

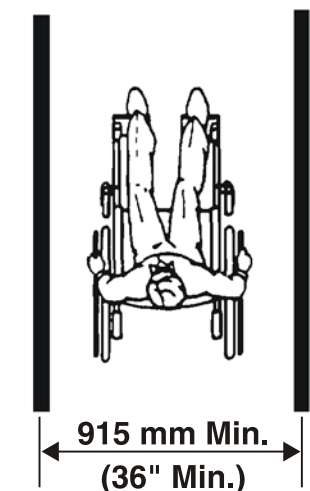
4. Roadway shoulders and the water table on bridge decks are not constructed to be pedestrian facilities and are therefore not required to comply with ADA requirements, although pedestrians are permitted to use them. Roadway shoulders and water tables on bridge decks should be constructed according to current design standards. If pedestrian needs are such that sidewalks are warranted along the corridor, but cannot be constructed; construct the shoulders according to current standards and, if practical, grade the area adjacent to the shoulder to facilitate future sidewalk installation. In the rare case pedestrian needs warrant construction of shoulders at 2%, Central Office ADA Coordinator approval is required. An executive summary of the pedestrian study and plans needed to give a corridor overview should be submitted with the approval request.

5. When replacing an existing bridge that has sidewalk, and there is no sidewalk on either approach to the bridge, the new bridge may not require sidewalk. The pedestrian study should check to see if there are future plans for sidewalk on the bridge approaches. If both approaches do not have sidewalk and there are no future plans for sidewalks on both approaches, then most likely sidewalk would not be warranted. The new bridge shoulders should be constructed according to current design standards, unless the bridge shoulders provide connectivity between two existing PAR's.

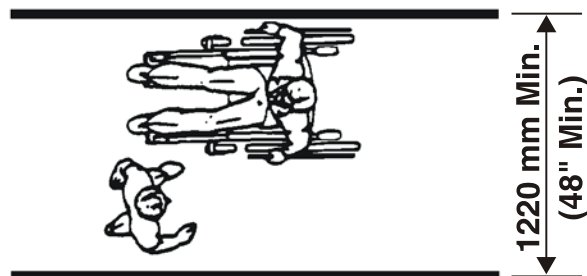
6. On July 26, 2011 the U.S. Access Board released for public comment proposed guidelines for accessible public rights-of-way. The guidelines provide design criteria for public streets and sidewalks, including pedestrian access routes, street crossings, curb ramps and blended transitions, on-street parking, street furniture, and other elements. The specifications comprehensively address access that accommodates all types of disabilities, including mobility and vision impairments, while taking into account conditions and constraints that may impact compliance, such as space limitations and terrain, as indicated in an overview of the rule. The 2011 proposed guidelines, or PROWAG, can be found here: www.access-board.gov/prowag/nprm.pdf.

7. Shared Use Paths are designed for both transportation and recreation purposes and are used by pedestrians, bicyclists, skaters, equestrians, and other users. The U.S. Access Board is currently in the process of developing guidelines for Shared Use Paths. Shared use path design is similar to roadway design but on a smaller scale and for lower speeds. Whether located within a highway right-of-way, provided along a riverbank, or established over natural terrain within an independent right-of-way, shared use paths differ from sidewalks and trails in that they are primarily designed for bicyclists and others for transportation purposes such as commuting to work.

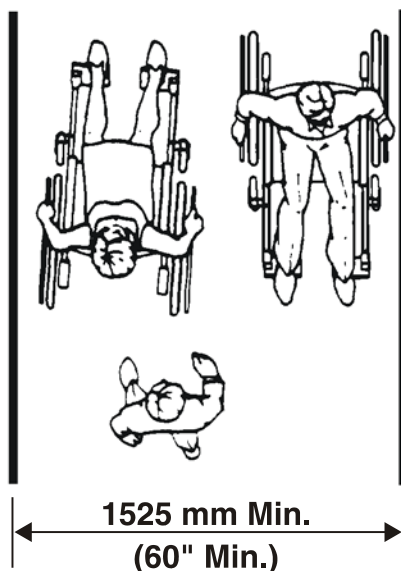
The Advanced Notice of Proposed Rulemaking (ANPRM) for Shared Use Paths, published on March 28, 2011, can be found at: www.access-board.gov/sup/anprm.pdf.



(a)
Minimum Clear Width
for Single Wheelchair



(b)
Minimum Passage Width for One Wheelchair
and One Ambulatory Person



(c)
Minimum Clear Width
for Two Wheelchairs

*The 2010 ADA Standards **minimum clear width does not equate to sidewalk width.** Sidewalk widths must be 1525 mm (60 in) minimum. The sidewalk width may be reduced to 1220 mm (48 in) if 1525 mm × 1525 mm (60 in × 60 in) passing areas are provided every 61 m (200 ft). Consider pedestrian volume in determining required sidewalk width. Minimum accessible path must be 1220 mm (48 in) minimum. These widths **exceed** the 2010 ADA Standards minimum clear width of 915 mm (36 in) for a single wheel chair due to the probability of multiple pedestrians.

FIGURE 6.1
Minimum Clear Width Dimensions

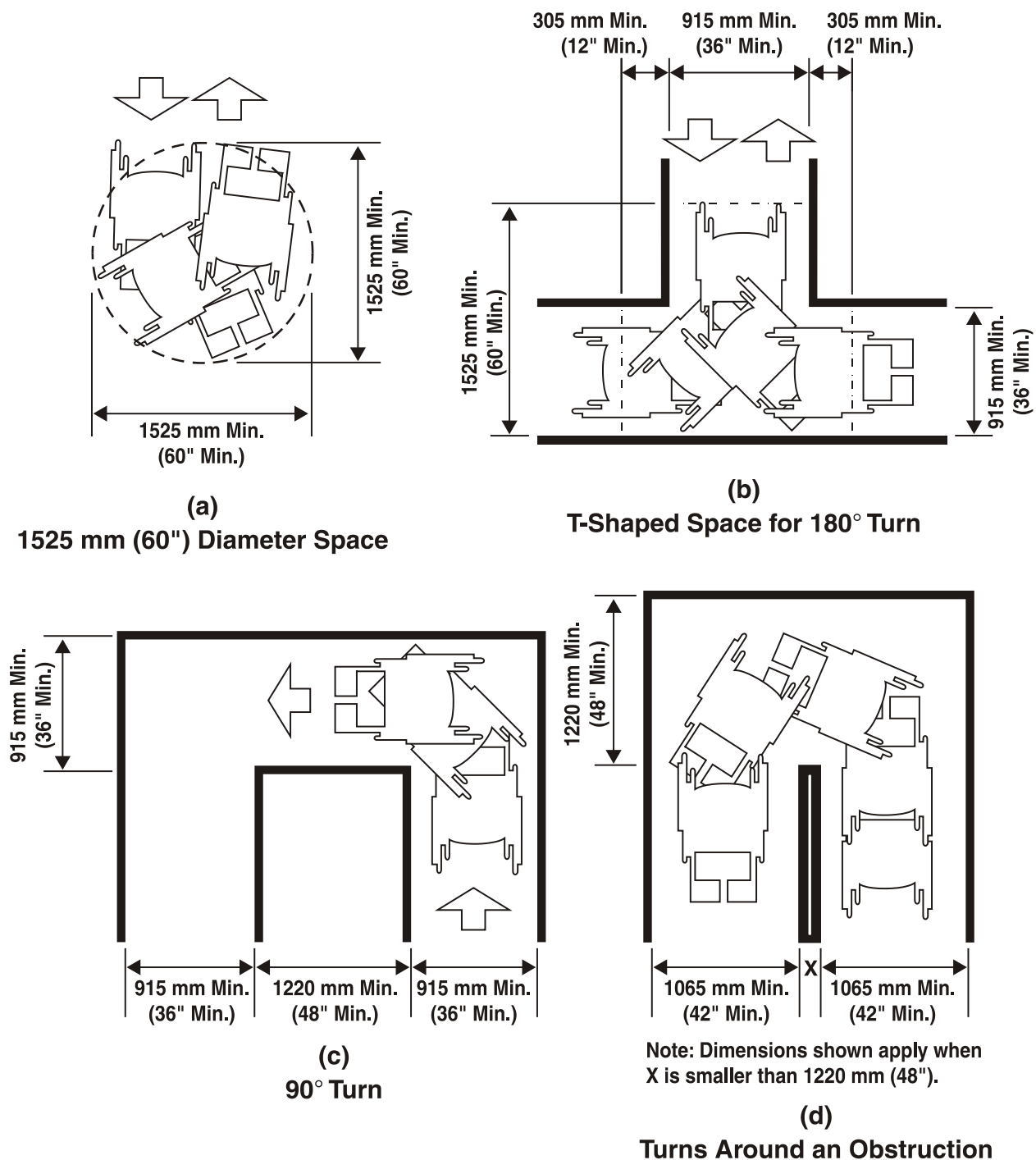
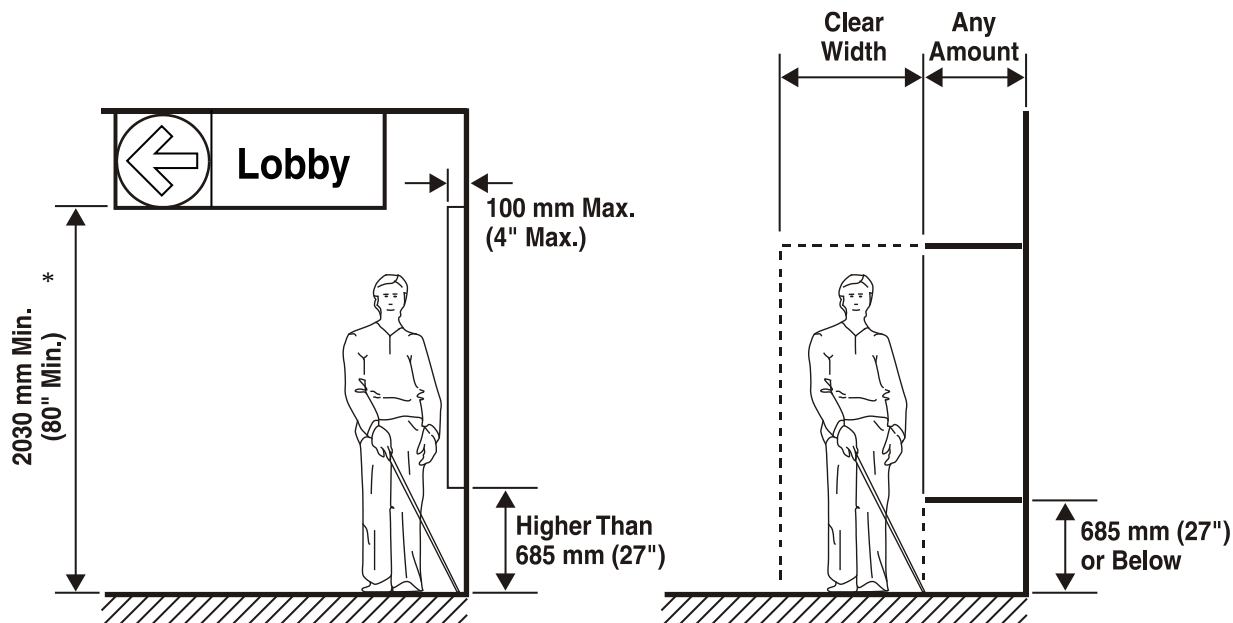


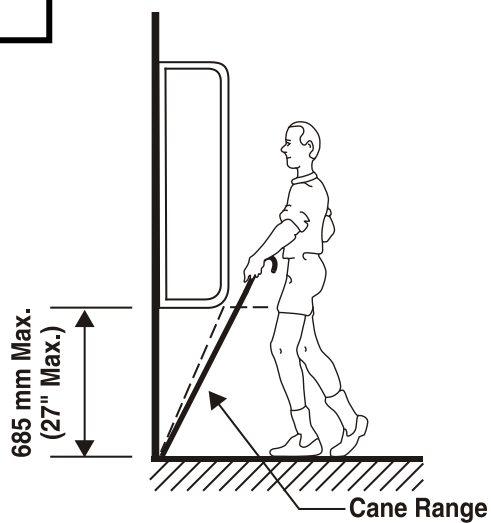
FIGURE 6.2
Wheelchair Turning Space



(a)

Walking Parallel to a Wall

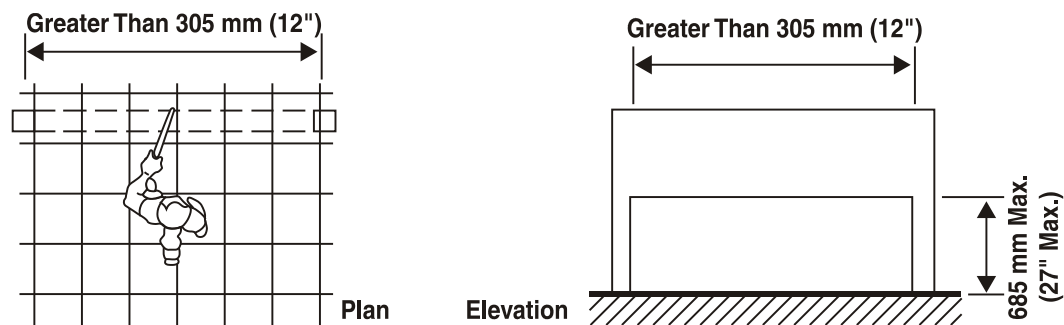
*Refer to the *MUTCD*
when placing traffic
signals.



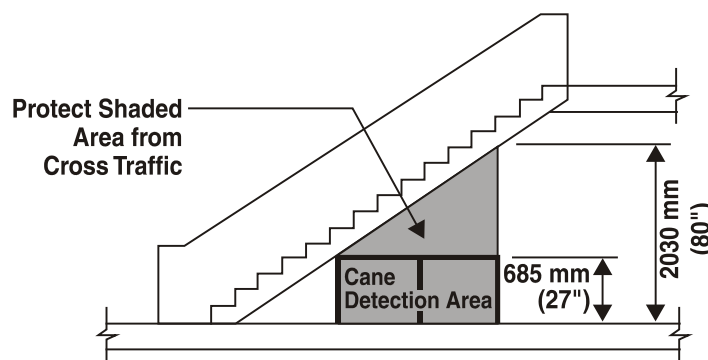
(b)

Walking Perpendicular to a Wall

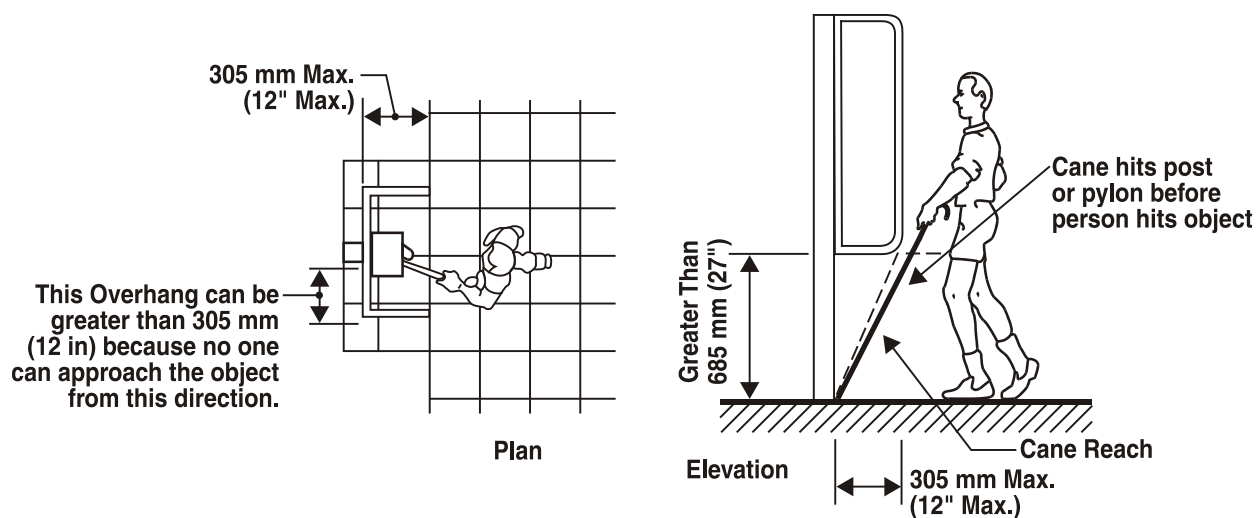
FIGURE 6.3
Protruding Objects



(c) Free Standing Overhanging Objects



(c-1) Overhead Objects



(d) Objects Mounted on Posts or Pylons

**FIGURE 6.3 (Continued)
Protruding Objects**

8. On June 20, 2007, the Access Board issued a Notice of Proposed Rulemaking (NPRM) to establish accessibility guidelines pursuant to the Architectural Barriers Act (ABA) for camping facilities, picnic facilities, viewing areas, outdoor recreation access routes, trails, and beach access routes that are constructed or altered by or on behalf of the Federal government. The latest version of The Draft Final Accessibility Guidelines for Outdoor Areas can be found at: www.access-board.gov/outdoor/draft-final.pdf.

6.6 SIDEWALKS

Sidewalks are an essential part of the urban street cross section. In rural and suburban areas, community development such as schools, local businesses, industrial plants and recreation areas may result in pedestrian concentrations that make sidewalks a necessity. In many cases, the absence of roadway lighting and higher traffic speeds in rural areas increases the potential for vehicle and pedestrian conflicts.

In general, wherever roadside and land development conditions affect regular pedestrian movement along a highway, sidewalks should be considered. As a general practice, sidewalks should be constructed along any roadway without shoulders where there is a need to provide pedestrian accommodation. Where sidewalks are built along a high-speed highway, buffer areas should be established to separate pedestrians from the travel way.

The following policy on sidewalks is consistent with the Smart Transportation theme to consider all highway corridor modes.

The Department may construct new sidewalks when pedestrian needs have been evaluated and the needs of pedestrians have been determined as follows:

1. A sidewalk has been programmed as a project or project component through the Transportation Improvement Program (TIP) process.
2. A municipality requests the inclusion of sidewalks to be installed as part of the programmed (post TIP) Department project. The municipality has agreed to fund the sidewalk construction and any additional right-of-way costs.
3. The Department may replace sidewalks when an existing sidewalk is removed, relocated or altered, as a result of the Department project.
4. The need to accommodate critical pedestrian safety needs has been identified within the limits of a Department project. (i.e., Pedestrians are forced to walk in traffic lanes between pedestrian generators with an existing or potential crash history.)

In all of the above scenarios, the municipality is responsible for future sidewalk maintenance. A maintenance agreement must be executed or ordinances clarifying maintenance responsibilities must be in place. If a municipality refuses to accept ownership and maintenance responsibilities for a proposed sidewalk, then that sidewalk should be deleted from the scope of work. If practical, grade the area adjacent to the shoulder to facilitate future sidewalk installation. Roadway shoulders and the water table on bridge decks are not constructed to be pedestrian facilities and are therefore not required to comply with ADA requirements, although pedestrians are permitted to use them. Roadway shoulders and water tables on bridge decks should be constructed according to current design standards.

Should the need for sidewalks be identified in the scoping process and the municipality is unwilling to participate in funding and/or maintenance responsibilities, the design and construction of the project should consider features that do not preclude future sidewalk installations. Topographical limitations and funding availability must be considered in this evaluation.

There are several tools available to analyze pedestrian needs:

1. Pedestrian Study Determination - [Chapter 6, Appendix E](#)

2. Bike/Pedestrian Checklist - Publication 10X, Design Manual, Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix S.
3. TE-672 Pedestrian Accommodation at Intersections Checklist, see the following link:
<https://www.pa.gov/content/dam/copapwp-pagov/en/pennidot/documents/public/pubsforms/forms/te-672.pdf>
4. Local and Regional Planning Documents

A. Agreements.

1. Establish an agreement between jurisdictional and contributing entities (Department, municipality, developer, project sponsor, etc.) on the cost sharing responsibilities for sidewalks that address the following conditions:
 - a. A reimbursement agreement clarifies the cost to be borne by the contributing entities of the total sidewalk, curbing and incidental construction costs.
 - b. A reimbursement agreement clarifies the right-of-way acquisition and costs, and utility relocations, adjustments and cost to facilitate the sidewalk.
 - c. A reimbursement agreement is required when Federal and/or State funds in combination with local matching funds are used for a project.
2. An agreement is not necessary if the above responsibilities are addressed through the issuance of a Highway Occupancy Permit (HOP).

B. Funding.

1. It is Department policy not to use State funds for sidewalk construction. At the discretion of the Department, State funds may be used for a limited number of applications as described below:
 - a. ADA compliance for alterations as defined in Americans with Disabilities Act policy and design guidance in this Manual.
 - b. The construction of new sidewalks to accommodate critical pedestrian safety needs that have been identified within the limits of a Department project.
 - c. To replace sidewalk where an existing sidewalk is removed, relocated or altered as the result of a Department project.
2. For sidewalks within public right-of-way:
 - a. Federal funds with local matching funds may be used for construction within public right-of-way when a pedestrian need is identified.
 - b. State funds may be used for construction within the public right-of-way for those applications noted in [Section 6.6.B.1](#).
3. For sidewalks outside existing public right-of-way:
 - a. Federal funds may be used on sidewalk outside public right-of-way if the sidewalk will be constructed as part of a Transportation Enhancement (TE) or Federal Safe Routes to School (SRTS) project.
 - b. Federal funds with local matching funds when applicable may be used on a right-of-way purchase required for sidewalk construction including ADA accommodations, to remediate a critical pedestrian

safety need, to replace an existing sidewalk, or for new sidewalk installations. The project scope includes right-of-way acquisition.

c. Federal funds and/or State funds may be used on private property, when replacing an existing curb ramp or when an "Authorization to Enter (Waiver of Claim)" is in place.

d. State funds may be used on a right-of-way purchase to construct those applications as noted in [Section 6.6.B.1](#).

C. Sidewalk Maintenance. Sidewalk maintenance is the responsibility of the municipality. The municipality may use its maintenance forces or require abutting landowners to maintain the sidewalk through municipal ordinances. Refer to the following for further guidance:

1. A maintenance agreement, generally between the municipality and the Department or municipal ordinances clarifying maintenance responsibilities, is required for a sidewalk on public right-of-way.
2. A maintenance agreement is required for a sidewalk on private property where local ordinances do not stipulate maintenance responsibilities.

D. Additional Support Information.

1. The Federal requirement for consideration of pedestrian need is provided in the Safe, Accessible, Flexible, Efficient Transportation Equity Act - a Legacy for Users (SAFETEA-LU) of 2005. Based on SAFETEA-LU, Federal funds may be used to construct sidewalks. Independent pedestrian-based projects are often funded through Transportation Enhancement, Hometown Streets, or Safe Routes to School projects. Furthermore, the Department's Smart Transportation Policy, Pennsylvania's Mobility Plan, the Statewide Bicycle and Pedestrian Plan and Context Sensitive Solutions, all strongly advocate enhanced pedestrian access and mobility.
2. The Department's legal authority to construct sidewalks emanates in part from the Highway Act of 1945; and Act 120.
3. Financing the cost of a new sidewalk to meet a critical pedestrian safety need may derive from different sources, including but not limited to the Surface Transportation Program (STP), TE, SRTS, Highway Safety Improvement Program (HSIP) funds, State funds, Act 44 funds, County funds, Bridge Bill funds, and Capital funds.

E. Highway Occupancy Permit. New development along existing highways may increase pedestrian traffic to the point that it is desirable to construct curbs and sidewalks. In this situation, the property owner or the local government may request a highway occupancy permit (HOP) to construct a curb and sidewalk within the Department's right-of-way. The permit should be prepared in accordance with the Department's "Highway Occupancy Permit Manual" and will be reviewed to ensure that the development plans identify appropriate curb ramp locations or other ADA accessibility requirements. The request to construct curbs on any State highway where curbs do not presently exist must be reviewed by the responsible PennDOT District Office to determine the effects of the curb on safety, capacity, drainage, and pedestrian access.

F. General Information. The Department should first attempt to enter into a maintenance agreement. However, sidewalks may be constructed by the Department on bridges or through tunnels with no abutting property ownership with whom to attach maintenance responsibility. In these rare cases, the Department may accept maintenance responsibility.

On projects where the Department's work requires the replacement of curbs and the sidewalk is not disturbed, the Department must replace the area of sidewalk needed to provide for curb ramp accessibility.

When the existing sidewalk width is equal to or greater than 1525 mm (60 in), the preferred width of new sidewalk connecting to existing sidewalk will equal the width of the existing sidewalk. When the existing sidewalk width is less than 1525 mm (60 in), the width and cross slope must be transitioned as indicated in Publication 72M, *Roadway*

Construction Standards, RC-67M. The approximate limits of sidewalk removal and replacement will be determined by the cross slope transition and the width transition, where the longest transition length controls.

Where sidewalk is to be replaced to a building line, the floor elevations and entrances will control the grade. Drainage flow must be away from the building at all points on the sidewalk.

Installing barriers such as railings, curbs, or walls along the edge of the sidewalk should be considered when adjacent ground surfaces abruptly fall away from the sidewalk elevation.

6.7 SIDEWALK DESIGN CRITERIA

Sidewalks must meet the following criteria:

1. See PAR requirements in [Section 6.5](#).
2. Minimum sidewalk width of 1525 mm (60 in). The sidewalk width may be reduced to 1220 mm (48 in) if 1525 mm × 1525 mm (60 in × 60 in) passing areas are provided every 61 m (200 ft). Consider pedestrian volume in determining required sidewalk width. Minimum accessible path width may not be less than 1220 mm (48 in). These widths exceed the 2010 ADA Standards minimum clear width of 915 mm (36 in) for a single wheelchair due to the probability of multiple pedestrians. See [Figure 6.1](#) for the 2010 ADA Standards minimum clear width dimensions associated with wheelchair accessibility.
3. Handrails are not required on sidewalks.
4. Sidewalks must be separated from vehicular travel lanes by curbs, planting strips or other barriers which will be continuous except where interrupted by driveways, alleys or connections to accessible elements.

6.8 PEDESTRIAN GRADE SEPARATION FACILITIES

A. Physical Separation. The physical separation of pedestrian and vehicular traffic and their associated control measures vary and depend largely on the following factors for consideration:

1. Pedestrian-generating sources in the area
2. Pedestrian crossing volumes
3. Vehicular traffic volumes to be crossed
4. Type of highway and number of lanes to be crossed
5. Location of nearest crossing facility
6. Number of vehicles turning at intersections

The intersection of pedestrians' access routes and vehicles may sometimes present serious problems, especially where arterial streets traverse a business district and there are intersections with high-volume cross streets. In extreme cases, grade separations for pedestrians provide the only satisfactory solution. Although separations for pedestrians are justified in some instances, at-grade crosswalks will remain the predominant form of crossing. Conflict is minimized if the crosswalks are properly placed, designed, maintained and operated. The use of other physical barriers such as median barriers, guide rail, refuge islands and fencing should also be studied to protect pedestrians at crossing locations.

In most cases, the use of a pedestrian overpass will be more acceptable than an underpass since pedestrians are more reluctant to use an underpass due to other safety considerations.

The aesthetic and economical design of pedestrian grade separation facilities should be encouraged and can best be accomplished by recognizing the need for pedestrian grade separation in the planning and preliminary design stages. This permits maximum latitude in site selection and grade line adjustments between the pedestrian grade separation facility and the highway.

B. Access. All pedestrian grade separation facilities must meet the following minimum accessibility criteria:**1. Access Provisions.**

- a. See PAR General Requirements in [Section 6.5](#) for additional requirements unless noted otherwise below.
- b. Provide pedestrian sidewalks and ramps at all separation structures. Where warranted and possible, a stairway can also be provided in addition to the ramp. In certain situations, access by platform lift (wheelchair lift) or elevator may be necessary. Note: Ramps are used to traverse an elevation difference at various locations such as building entrances; curb ramps are used to traverse the elevation difference of a curb. See [Section 6.9](#) for Curb Ramp Design Considerations.
- c. Some persons with mobility impairments may find lengthy ramps more difficult to negotiate than stairs complying with the proper design criteria. Care is necessary to avoid inadvertently creating a mobility problem for one group of people while accommodating another group.
- d. Walkways should have a minimum 2440 mm (96 in) width.
- e. Maximum slopes of adjoining accessible routes not to exceed a gradient of 1V:20H (5.00%).
- f. Walkways with a slope gradient greater than 1V:20H (5.00%) will be considered ramps.

2. Ramps and Landings.

- a. Use flattest gradient possible. Ramp slopes between 1V:20H (5.00%) and 1V:16H (6.25%) are preferred for easier access. Wheelchair users with disabilities affecting their arms or with low stamina have serious difficulty using inclines (ramps). Many people cannot manage a 1V:12H (8.33%) slope for a 9 m (30 ft) distance. The maximum ramp slope is 1V:12H (8.33%).
- b. Maximum length of ramps between landings is dependent on the slope and horizontal projection as indicated in [Table 6.1](#).
- c. Maximum rise between landings is 760 mm (30 in).
- d. Landing width must be at least as wide as the widest ramp run approaching the landing and have a minimum clear length of 1525 mm (60 in) due to a confined turning space.
- e. If a ramp changes direction at a landing, the minimum landing size must be 1525 mm × 1525 mm (60 in × 60 in) due to a confined turning space.
- f. Ramps must have level landings at the bottom and top of each run.
- g. Circular style ramps are not recommended since they normally have non-uniform cross slopes which do not permit all wheelchair wheels to be on the ground at the same time. The lack of level landings also does not permit any resting areas for people with limited stamina.

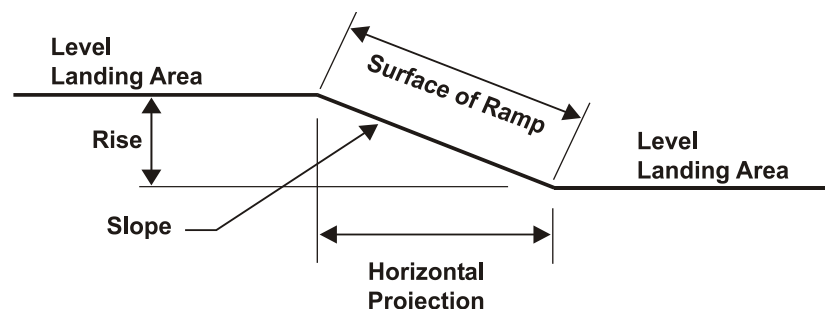


TABLE 6.1
RAMPS BETWEEN LANDING AREAS

TYPICAL RAMP DIMENSIONAL ELEMENTS BETWEEN LANDING AREAS		
SLOPE	RISE (Maximum)	HORIZONTAL PROJECTION (Maximum)
1V:12H < 1V:16H	760 mm (30 in)	9 m (30 ft)
1V:16H < 1V:20H	760 mm (30 in)	12 m (40 ft)

3. Handrails (See [Figures 6.4, 6.5 and 6.6](#)).

- a.** In addition to any protective railings, parapets or fencing, provide handrail on both sides of all stairways and ramp runs exceeding a 150 mm (6 in) rise or an 1830 mm (72 in) horizontal projection in order to provide support for balance and security in ascending or descending the structure.
- b.** Top of gripping surface for handrail must be mounted between 860 mm and 965 mm (34 in and 38 in) above the ramp surface and be parallel with the ramp or landing surface.
- c.** Where handrails are not required, provide a 50 mm (2 in) minimum height curb or other vertical guard to prevent drop off from ramp or landing.
- d.** Ends of handrail must be either rounded or returned smoothly to floor, wall or post and should not project into any walkway.
- e.** Clear space between handrail and wall surface must be a minimum of 38 mm (1.5 in).
- f.** If handrails are not continuous, they must extend at least 305 mm (12 in) beyond the top and bottom of the ramp segment.
- g.** Handrails must not rotate within their fittings.
- h.** Avoid recessed handrail locations in vertical surfaces.
- i.** Handrail materials should be capable of withstanding bending moments of at least 1112 N (250 lb) horizontal concentrated load. Fasteners and support mounts should withstand an 1112 N (250 lb) shear load and 1112 N (250 lb) tensile load.

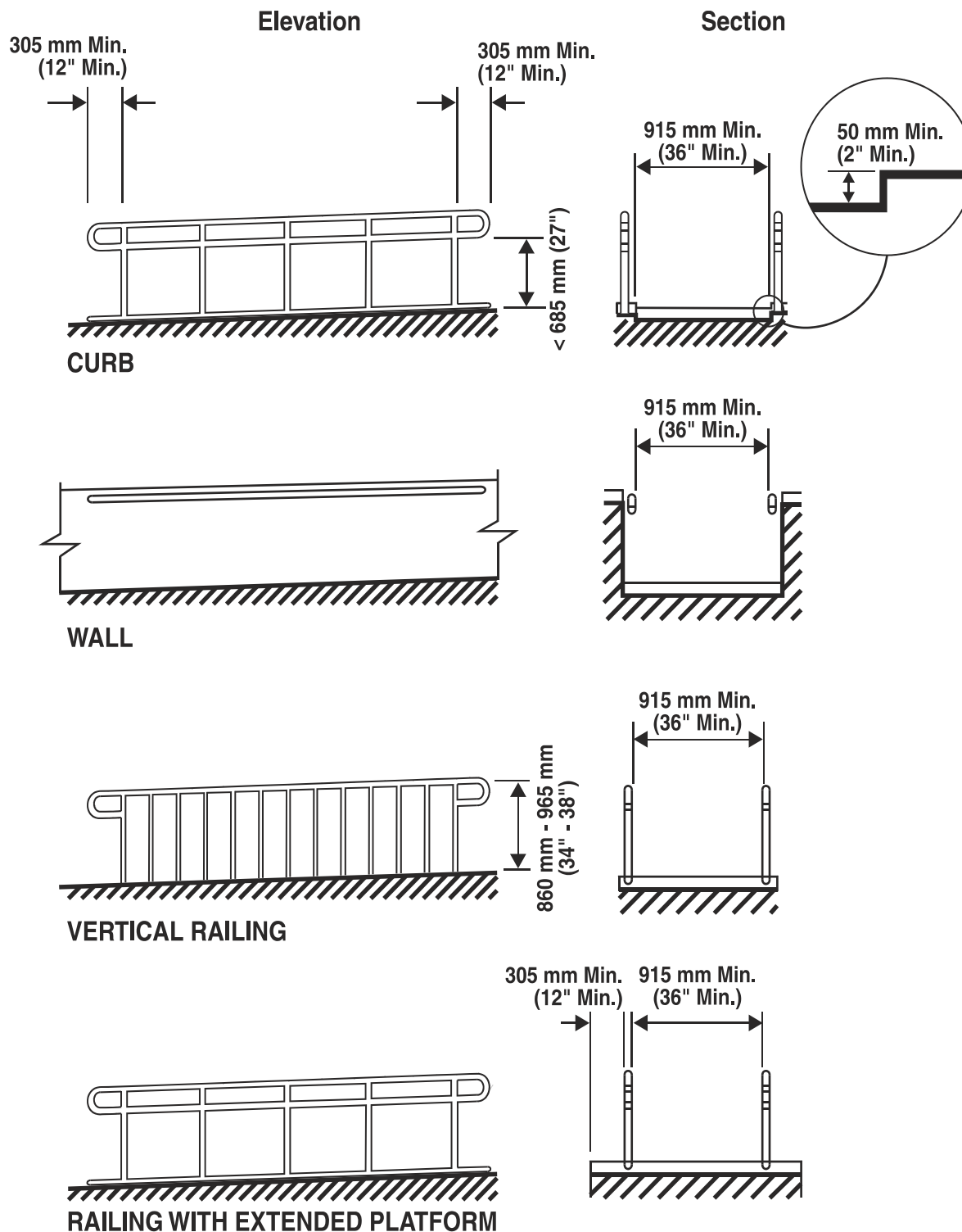


FIGURE 6.4
Examples of Edge Protection and Handrail Extensions

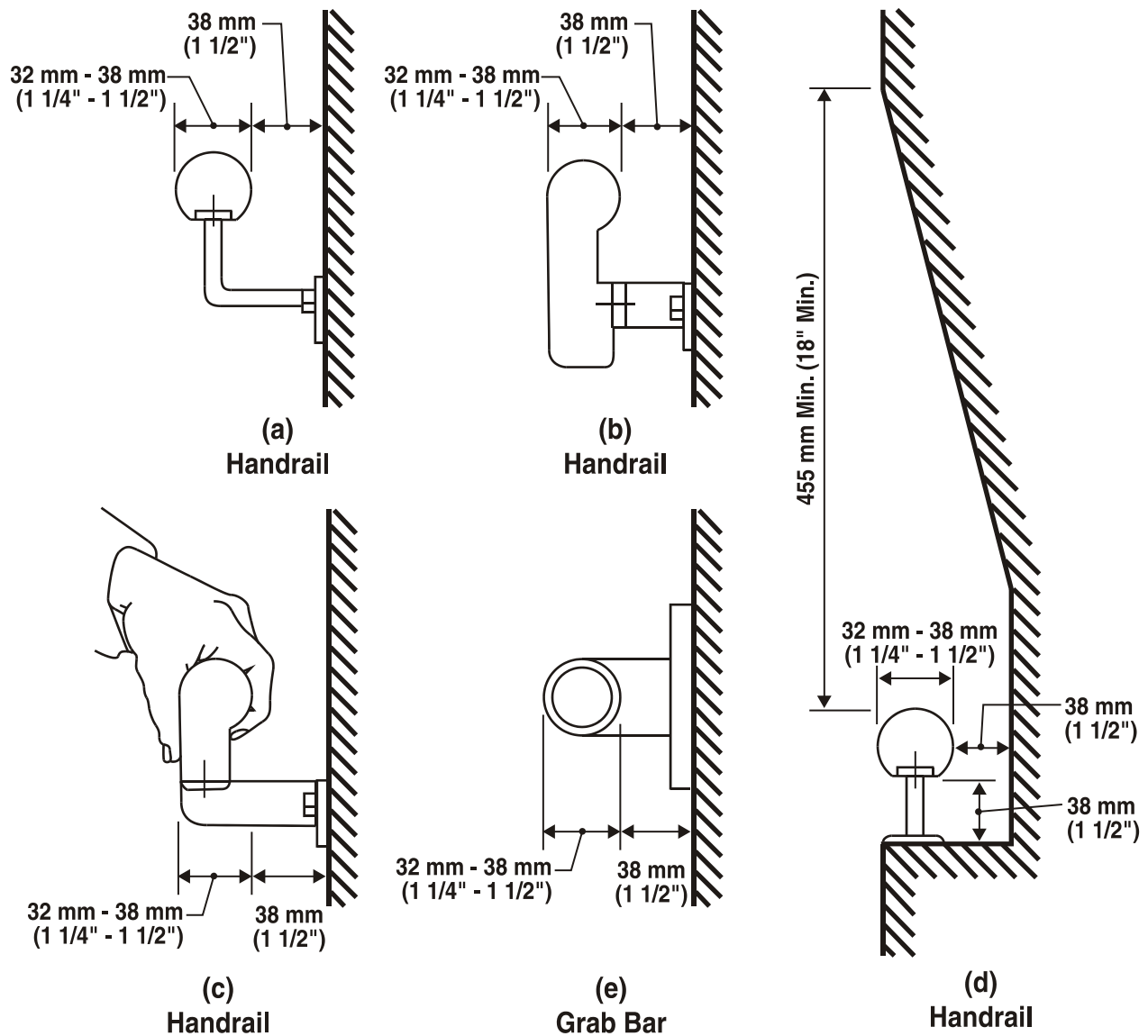
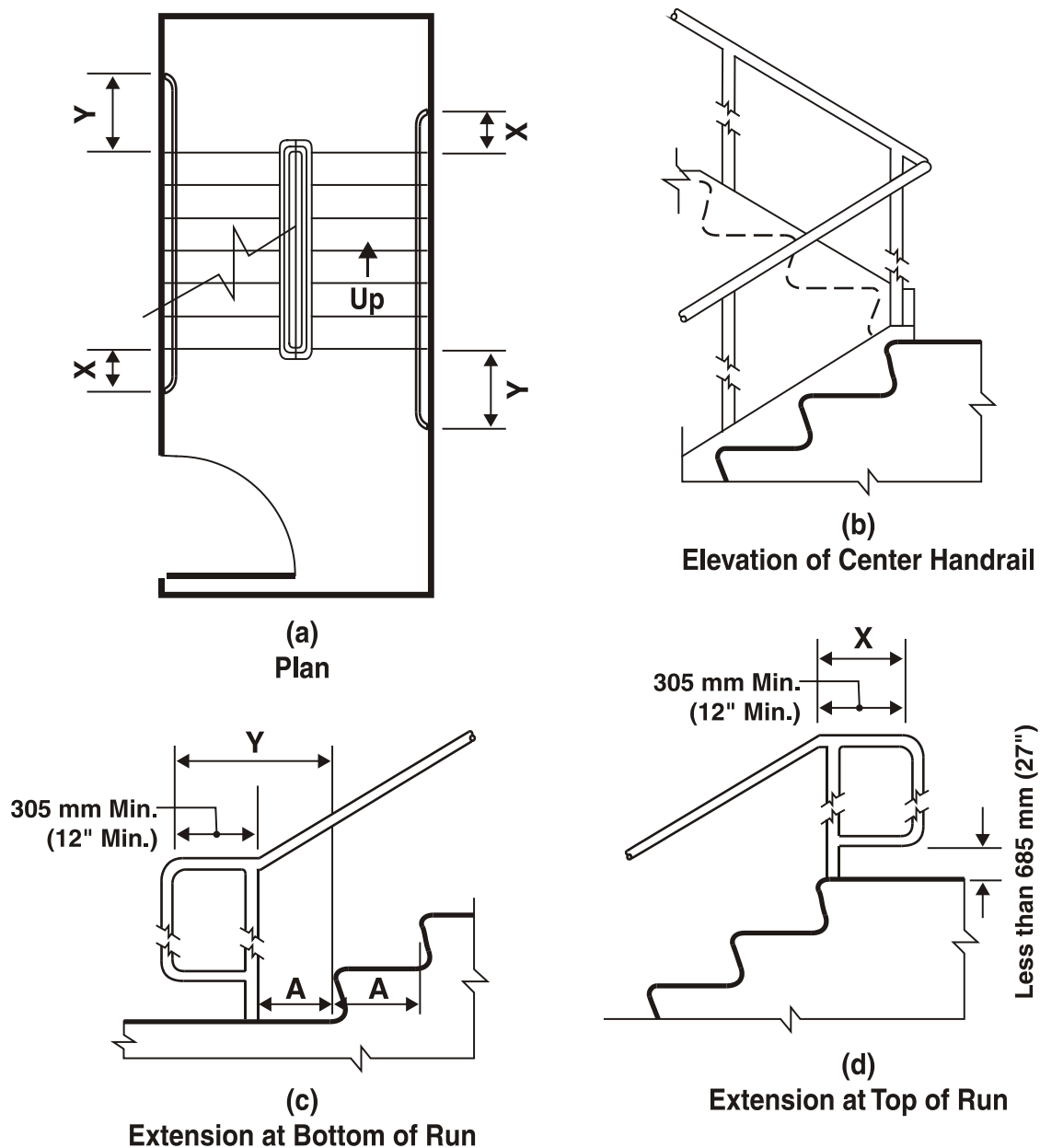


FIGURE 6.5
Size and Spacing of Handrails and Grab Bars

**NOTE:**

X is the 305 mm (12 in) minimum handrail extension required at each top riser.

Y is the minimum handrail extension of 305 mm (12 in) plus the width of one tread (A) that is required at each bottom riser.

FIGURE 6.6
Stair/Step Handrails

- 4. Stairways** (See [Figures 6.6](#) and [6.7](#)).
 - a.** Maximum 180 mm (7 in) riser (R = vertical rise in millimeters (inches)), 130 mm (5 in) is preferred.
 - b.** Tread (T = horizontal projection in millimeters (inches)) length designed to appropriate standard stair design formulas to achieve the needed slope as approved. Minimum tread width of 280 mm (11 in). A common stair design formula is $2R + T = 660$ mm (26 in).
 - c.** Use rounded tread nosing with maximum 13 mm (0.5 in) radius of curvature.
 - d.** Provide landing for every 1525 mm to 1830 mm (60 in to 72 in) change in elevation and if possible avoid using over 10 steps or less than three steps per flight.
 - e.** Provide handrail along both sides of the stairway.
 - f.** Winding the stairway or reversing the stair direction alignment can reduce space requirements.
 - g.** Pitch stairs surface so that water will not accumulate on walking surfaces. Maximum pitch is 2.00%; 1.00% pitch is recommended.
 - h.** Do not use open tread steps or steps with projected nosings.
 - i.** No part of a stairway should overhang a walkway at or below head height. A clear head room passageway above the walkway of 2135 mm (84 in) minimum is required.
 - j.** Stairways that lead to a walkway should be setback from the edge of the stair nosing at least 585 mm (23 in) from the walkway at the bottom and at least 305 mm (12 in) at the top.
- 5. Additional Criteria.** Additional design criteria for pedestrian grade separation facilities are found in the AASHTO Bridge Specifications.
- 6. Lighting.**
 - a.** The installation of lighting at pedestrian grade separation structures should be carefully considered.
 - b.** Stairways which have regular use should have at least shadow lighting to indicate the beginning and end and if possible the edge of each tread.
 - c.** The simplest lighting approach is an overhead light placed to one side on the upper height of the stairway with the luminaires directed to shine down upon the stairway. Avoid placing landscape plant material in locations where their shadows may obscure the intended light illumination on the ramp or stairway.
 - d.** An illumination guideline for ramps or stairways is to provide a minimum average of 22 lx (2.0 footcandles) of light on the intended surface.

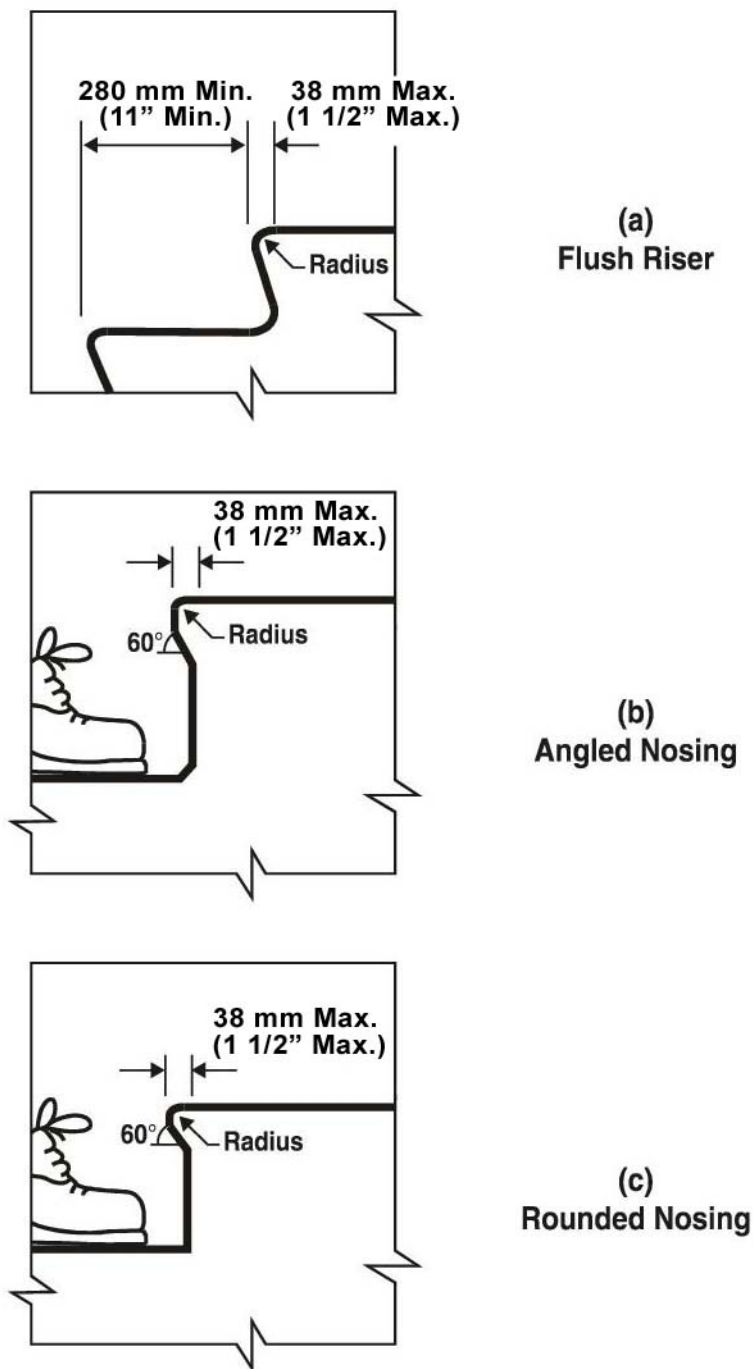


FIGURE 6.7
Usable Tread Width and Examples of
Acceptable Nosings

6.9 CURB RAMP DESIGN CONSIDERATIONS

A. Existing Conditions. Curb ramps are constructed to permit people in wheelchairs to cross a curb with ease. Design of curb ramps may vary in relation to the following existing conditions:

1. Sidewalk width.
2. Sidewalk location with respect to the back face of curb.
3. Height and width of curb cross section.
4. Design turning radius and length of curve along the curb face.
5. Angle of street intersection(s).
6. Planned or existing location of sign and signal control devices.
7. Stormwater inlets and public surface utilities.
8. Possible sight obstructions.
9. Street width.
10. Other physical obstructions such as buildings, bridges and walls.
11. Roadway grade.
12. Parking spaces.

The ADA Law, 28 CFR Part 35.151(e) - New construction or alterations provides the general direction for the placement of curb ramps: (1) Newly constructed or altered streets, roads and highways must contain curb ramps or other sloped areas at any intersection having curbs or other barriers to entry from a street level pedestrian walkway. (2) Newly constructed or altered street level pedestrian walkways must contain curb ramps or other sloped areas at intersections to streets, roads, or highways.

Resurfacing projects and "curb ramp only" projects do not typically include changes to roadway geometry, including roadway profile grade. When the roadway profile grade exceeds 2%, and profile adjustments are not in the scope of work, the depressed curb must be constructed to match the roadway profile and the curb ramp cross slope will transition to meet the roadway profile grade as gradually as possible, but not to exceed a rate of change of 3% per LF. In normal crown sections, stormwater flow must be maintained along the curb line and the roadway should not be adjusted in any way that would alter the flow line. Transitioning the curb ramp cross slope to the roadway profile allows the pedestrian to adjust to the cross slope of the crosswalk in the safety of the area behind the curb and does not push stormwater into the vehicular path. Curb ramps and the flared sides of curb ramps shall be located so that they do not project into vehicular traffic lanes, parking spaces, or parking access aisles.

B. General Considerations. All curb and sidewalk areas being constructed or reconstructed in the Commonwealth must provide curb ramps for persons with physical disabilities as shown in Publication 72M, *Roadway Construction Standards*. The following must be considered in the design of curb ramps.

1. A curb ramp must be provided at locations that meet the criteria of the referenced ADA Law, Part 28 CFR Part 35.151(e).
2. All slopes are measured with respect to a level plane. The upward pitch (slope) of a road profile or sidewalk away from the curb will effectively increase the total height to be negotiated by the curb ramp.
3. Crosswalk markings serve primarily to guide pedestrians across roadways in the proper path and also to warn the motorist of a pedestrian crossing point.
4. Curb ramps should be wholly contained within marked pedestrian crosswalks (excluding flared sides for non-diagonal curb ramps) to keep crosswalk widths to a minimum and to enable ramp use to be incorporated as part of the established pedestrian control at the intersection.
5. Separate curb ramps to provide space for curb ramp flares and landing areas. Moving the curb ramp to the side may increase the width of the crosswalk. See [Figure 6.8](#).
6. Curb ramps are not limited to intersections and marked crosswalks but should also be considered at other appropriate points of pedestrian concentration or access such as refuge medians/islands, mid-block crossings, parking areas and other traffic separation islands. At uncontrolled pedestrian crossings, a warrant analysis may

be required to evaluate pedestrian needs and safety. Access may also be provided at raised median, refuge and other traffic islands by providing a level street elevation crossing cut through the island. Islands or medians to be accessed by curb ramps on each side should be wide enough to have a minimum 1220 mm (48 in) level [1V:50H (2.00%)] surface between the curb ramps.

7. Adequate visibility is required to ensure safe pedestrian movement. A sight distance study is recommended to ensure that curb ramps are not placed at locations where motorists cannot see the low profile of people using wheelchairs. Vehicle parking must be eliminated at least 6.0 m (20 ft) from the inside pedestrian crosswalk line at intersections. Parking may also be eliminated at midblock crossings to provide access from the curb ramp and to increase the visibility of the pedestrian. See [Chapter 6, Appendix F](#) for standard letters.

8. Built-up curb ramps are not permitted in new construction and their use must be carefully evaluated in any alteration work location. Built-up curb ramps should not project into any vehicular traffic lane, parking space or access aisle. Built-up curb ramps are best utilized in parking lots or locations removed from vehicular traffic or major curb drainage flows. Snow removal considerations around these ramp projections must also be evaluated when considering the use of a built-up curb ramp.

9. Mountable curbs are not suitable for pedestrian access unless their design conforms to the curb ramp design criteria. Plain concrete gutter should not be used where curb ramps are proposed.

10. Raised median islands in crossing locations should not be less than 1220 mm (48 in) deep for cut through street level access openings. To allow for attendant assisted wheelchairs, 1830 mm (72 in) is required.

11. Curb ramps serving adjoining crosswalks should not be located too close to each other in order to avoid excessive undulating pavement surfaces which can be uncomfortable to walk on or become unsafe for pedestrians. See [Figure 6.8](#) for the preferred design and [Figure 6.9](#) for the non-desirable design. This situation often occurs at intersections having a curb radius less than 4.5 m (15 ft). As a last resort a continuous, wide, diagonal curb ramp may be considered in this situation for alteration work but is not permitted in new construction. Note: Diagonal curb ramps provide less pedestrian protection from turning vehicles and require ADE of Design approval.

12. If a curb ramp or other ADA accessibility feature cannot be designed to the appropriate standards, then a Technically Infeasible Form must be prepared describing the existing site constraints, design alternatives evaluated and the design alternative selected to provide access to the maximum extent feasible. The form must be reviewed, approved by the ADE of Design or delegate and placed in the project design document file.

13. Curb ramps must be oriented in such a fashion that the grade break is approachable by a pedestrian in a wheelchair. This can be accomplished by installing the curb ramp perpendicular to the curb. This allows for a wheelchair to make contact with both wheels before experiencing a change in grade. This may cause the curb ramp to not be in alignment with the crossing direction. The curb ramp may be installed in the same direction as the crossing and not perpendicular to the curb when a triangular landing is provided. This provides non-visual cues for pedestrians with visual disabilities. The triangular landing must be approximately level [1V:50H (2.00%)]. See [Figure 6.11](#).

14. Narrow sidewalks may not provide the necessary space to install perpendicular curb ramps. A different curb ramp type such a Type 2 or Type 6 curb ramp must be considered. See [Figure 6.12](#).

15. Where a pedestrian circulation path crosses the curb ramp, flared sides shall be sloped 10 percent maximum, measured parallel to the curb line. The use of steeper flares is acceptable provided they are protected from pedestrian traffic. See [Figure 6.13](#).

16. Excessively steep curb ramps may deny access and must be reconstructed with an appropriate slope or be replaced by a different type of curb ramp. See [Figure 6.14](#).

17. Vertical drops or lips located within the PAR may cause a pedestrian to trip or deny access to a pedestrian using a wheelchair. Curbed flares must be located outside of the pedestrian access route. A non-walk surface such as grass limits the PAR and will allow the installation of a curbed flare. See [Figure 6.15](#).

18. Sidewalks, curb ramps and roadway drainage features must be designed and constructed to prevent surface drainage from ponding at the bottom of the curb ramp. Edge of road elevations at the flow line must be graded to ensure positive drainage. For new construction, additional inlets may be required to prevent drainage issues. See [Figure 6.16](#).

19. In all cases, the designer must attempt to design using the smallest possible corner turning radius to improve overall intersection efficiency. The use of small turning radii provides many improvements such as:

Motor vehicle traffic must slow to make a turn, making it safer for pedestrians. Less head turning is required of motor vehicle drivers because they approach the intersection at closer to right angles. Crosswalks are shorter (sometime as much as 50% shorter), which decreases pedestrian crossing time, thus decreasing pedestrian green time. This is very important to persons who use walkers, canes, or otherwise have a slower crossing speed. Longer crossing distances may intimidate them into not even using the intersection. Crosswalks are closer to the intersection, improving overall sight distance. More sidewalk space is provided for pedestrians. Curb ramps can be built perpendicular to the crosswalks, enabling persons with visual disabilities to more easily navigate the intersection. Smaller radii greatly reduce the need for diagonal curb ramps. Long wheelbase vehicles may find it more difficult to turn. However, this can be addressed by pulling back the stop bar in the receiving street. If this involves a multi-lane street, pulling back the stop bar also improves safety and reduces motor vehicle/pedestrian crashes.

20. Diagonal curb ramps should be avoided. They offer limited guidance to the location of the crosswalk to pedestrians with visual disabilities.

21. The use of sidewalk bulb-outs should be considered where applicable to reduce crosswalk length and provide needed space to install curb ramps.

22. People with visual impairments often have difficulty using curb ramps since the curb ramp makes locating the edge of the street more difficult and the ramps and side flare surfaces may be more difficult to walk across. See [Figure 6.17](#). Where possible, the curb ramps should be separated as far as possible but parallel to the direct line of pedestrian movement. See [Figure 6.8](#).

23. The appropriate level of detail must be provided on the plans to ensure compliant construction. See [Figure 6.18](#) for an overview of required details.

C. New Construction. The guidelines presented in this Chapter will apply to new construction unless specifically noted for alteration work only.

D. Alterations. The following should be considered for curb ramps in alteration projects.

1. Designing curb ramps for alteration projects will generally be more difficult than for new construction projects because existing conditions such as buildings, walls, sidewalk gradients, right-of-way width, etc. may limit the space available to provide the required accessibility. Specific curb ramp locations should be adapted to existing site conditions.

2. Curb ramps may necessitate the relocation of various existing features such as street signs, mailboxes, telephone booths, newspaper dispensers or other obstacles interfering with the desired accessibility. Relocating major utility conflicts such as fire hydrants, light poles, utility poles and drainage inlets should be assessed on a case by case basis.

3. Although existing conditions may dictate that pedestrian crosswalks be prohibited at an intersection, this restriction could possibly change at some time in the future. Appropriate measures, such as signal pole location

and placement of other utilities, should be taken to allow for future curb ramps. Curb ramp design is dependent on many factors; therefore, depressed curbs will not be installed for future curb ramp locations.

4. In general, when an existing space in the highway right-of-way is to be altered, each element in the space within the project scope or limits must comply with applicable requirements for new construction to the maximum extent feasible.

5. Alteration projects must not decrease or have the effect of decreasing the accessibility of a facility or a pedestrian circulation route below the requirements for new construction in effect at the time of the alteration. However, where the nature of the existing facility to be altered makes it technically infeasible to meet PennDOT's standards through the planned alteration, the maximum access feasible must be provided. For example, for an overlay project, an existing curb ramp must be upgraded and as a result the sidewalk must be closed. The alternate route is a sub-standard width sidewalk that cannot be expanded due to limited right-of-way. Other alternatives evaluated did not provide a greater level of access than the sub-standard width sidewalk. In this case it is technically infeasible to provide access fully meeting the standards during construction; however, access is provided to the maximum extent feasible given the situation.

6. An alteration of an existing facility must not impose a requirement for accessibility greater than required for new construction.

7. Alteration projects will not be required to expand a planned scope of work to include other items of accessibility. The scope of alteration work includes only the work included in the limits, boundaries, or scope of a planned project with no obligation to expand the scope or limits of a project to include other work or adjacent areas.

8. Existing project site conditions may limit accessibility design choices and should be identified early in the project scope. Depending on project scope, alteration projects may not require obtaining additional right-of-way. Alterations do not require narrowing roadway widths to comply with the design standards.

9. Newly issued accessibility guidelines will not require the need to upgrade existing accessibility facilities in the highway right-of-way at the time of the new guideline issuance if the accessibility facilities were constructed using previously approved accessibility standards. However, construction upgrades to the new standards will apply when the existing pedestrian route or facility is to be altered as part of a new planned project improvement to the roadway.

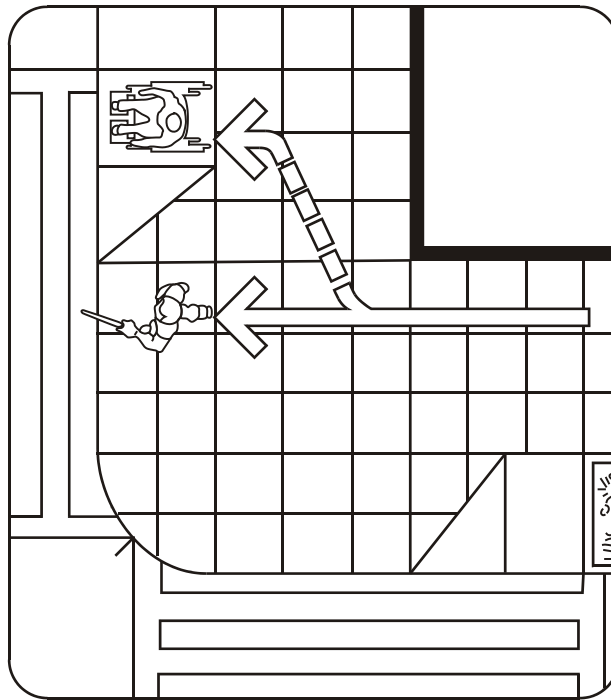
10. Alteration projects that include the installation of or relocation of telephone/utility poles, posts, street trees, fire hydrants, or other types of street furniture on or near existing pedestrian pathways will provide the required accessibility clearances designated for a pedestrian access route.

11. Any temporary construction activities required for alterations that affect existing pedestrian circulation paths will require the provision of a safe, alternate and accessible pedestrian route around the construction activities. The alternate route must comply with all applicable design guidelines to the maximum extent feasible so that the usability of the accessible route is maintained. The alternate route will be kept in place through the duration of the construction activity. See [Section 6.14](#), Temporary Alternate Circulation Paths at Construction Sites.

E. Ramp Types. Curb ramp design criteria can be adapted to provide various configurations which may allow curb ramp installations in limited space conditions. See [Figure 6.10](#) for adaptive curb ramp installations. Publication 72M, *Roadway Construction Standards*, RC-67M provides construction details for several curb ramp types that can be adapted to both new construction and alterations.

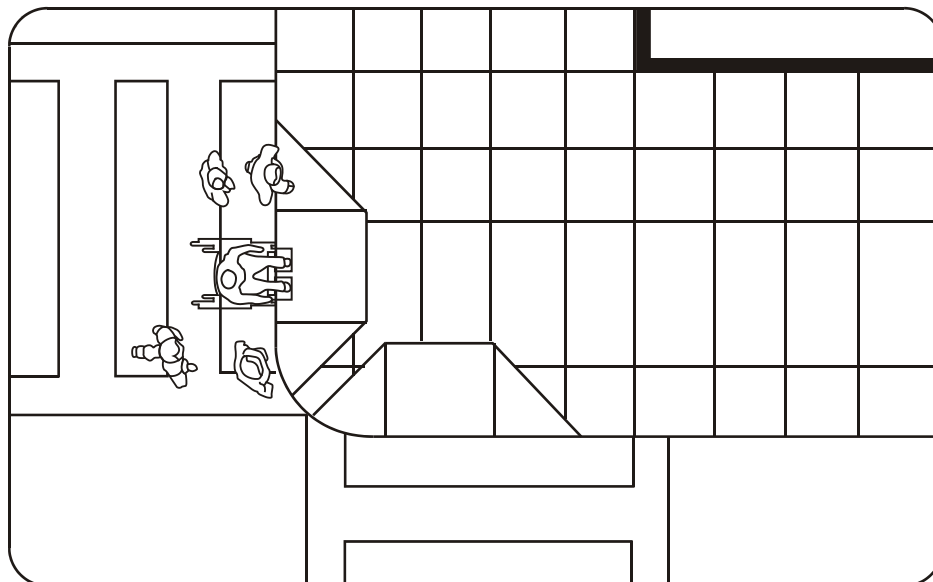
1. Type 1. The Type 1 curb ramp consists of a curb ramp and level landing for turning maneuvers at the top of the ramp. This curb ramp is ideal for locations where the existing sidewalk width is wide, provides a consistent path and allows the pedestrian to bypass the curb ramp when continuing on the sidewalk. The steeper ramp slope at the depressed curb provides better drainage than other curb ramps. The drawback of this curb ramp is the relatively wider required sidewalk width needed to install the curb ramp.

2. Type 2. The Type 2 curb ramp contains two ramps and a level landing at the roadway elevation. This curb ramp can be used on narrow sidewalks. Drawbacks include a flat slope at the depressed curb and pedestrians must traverse the curb ramps whether or not they desire to cross the street.
 3. Type 3. The Type 3 curb ramp consists of a ramp that brings the street up to the top of the normal or non-depressed curb. Type 3 curb ramps can be used in situations where there is insufficient or no area available beyond the curb for other types of curb ramps. Type 3 curb ramps may not be used in locations where the ramp will project into vehicle traffic lanes, parking spaces, access aisles or interfere with curb drainage flows or snow removal operations. Type 3 curb ramps are not permitted in new construction. Negatives include pedestrians with visual disabilities may be confused by the detectable warning surface on the sidewalk and possible damage during snow removal operations.
 4. Type 4 and Type 4A. Type 4 and Type 4A curb ramps are similar to a Type 1 curb ramp but utilize a curb or a steep flare slope that is placed outside of the path of the pedestrian. A non-walk surface or permanent barrier must deter or protect the pedestrian from crossing the unexpected vertical drop of the curb or steep flare slope. These curb ramps provide flares that may be installed where utilities limit the installation of flatter slopes. Depending on turning maneuvers, a landing may still be required.
 5. Type 6. The Type 6 curb ramp is a combination ramp that utilizes a ramp from the street leading to a landing where the pedestrian can access both left and right directions for a total of three ramps. A plain cement concrete curb cheek wall is necessary to fit the curb ramp into the adjacent ground surface. This curb ramp is ideal in residential areas where a green/planted strip separates the sidewalk from the curb. Drawbacks include the pedestrian must traverse the ramps when continuing on the sidewalk and the additional form work to construct.
 6. Blended Transition. The blended transition pedestrian walkway is not considered a curb ramp since all surfaces slopes are less than 1V:20H (5.00%) gradient. This flat pedestrian transition connection to the level of the roadway is good for wheelchair users, but is less desirable for persons with visual impairments since locating the edge of the roadway is more difficult and less protection from turning vehicles is provided. Guidelines in [Figure 6.17](#) must be followed when considering this type of pedestrian walkway.
 7. Median or Refuge Island Access Openings. These openings provide access through a median or refuge island where there is need for pedestrians to walk across the median or island. The Type B detail indicates a sloped flare side to connect to the adjacent ground surface, but this flare is not designed to be an accessible slope. The median opening is only intended for narrow openings. If drainage flows through the opening, debris will collect on the truncated domes.
 8. Ramped Medians or Islands. This design places back to back curb ramps separated by a landing area. The landing area is intended to provide pedestrians a resting area. The ramps as compared to an access opening will not allow drainage to flow directly through the median and thus prevents debris collection. This design is difficult to use since the median width must be wide enough to install the ramps and landing area.
- F. Non-standard Curb Ramps.** When a standard curb ramp cannot be installed due to existing conditions, a non-standard curb ramp may be needed. Non-standard curb ramps must meet the curb ramp design criteria. See [Section 6.11](#), Curb Ramp Design Criteria. When a non-standard curb ramp is used, appropriate detail must be included in the construction plans.



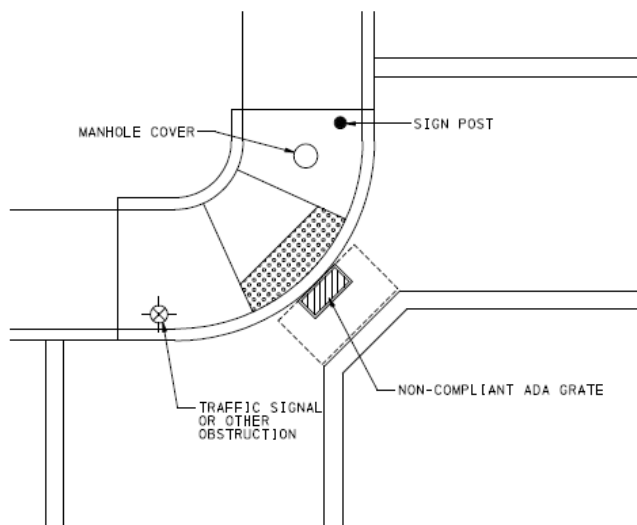
Note: Curb ramp located to the side, away from direct line of pedestrian movement.

FIGURE 6.8
Curb Ramps at Marked Crosswalks



Note: Avoid locating curb ramps too close together.

FIGURE 6.9
Curb Ramps at Marked Crosswalks



POTENTIAL SOLUTIONS:
FOR ALTERATIONS: UTILITIES IN THE PATH OF TRAVEL ARE ACCEPTABLE IF A 4'-0" PEDESTRIAN PATH IS MAINTAINED, THE TOP SURFACE IS FLUSH (LESS THAN 1/4" IN ELEVATION DIFFERENCE), FIRM, STABLE AND SLIP RESISTANT. INLET GRATES MUST HAVE OPENINGS NO GREATER THAN 1/2" IN DIRECTION OF TRAVEL.

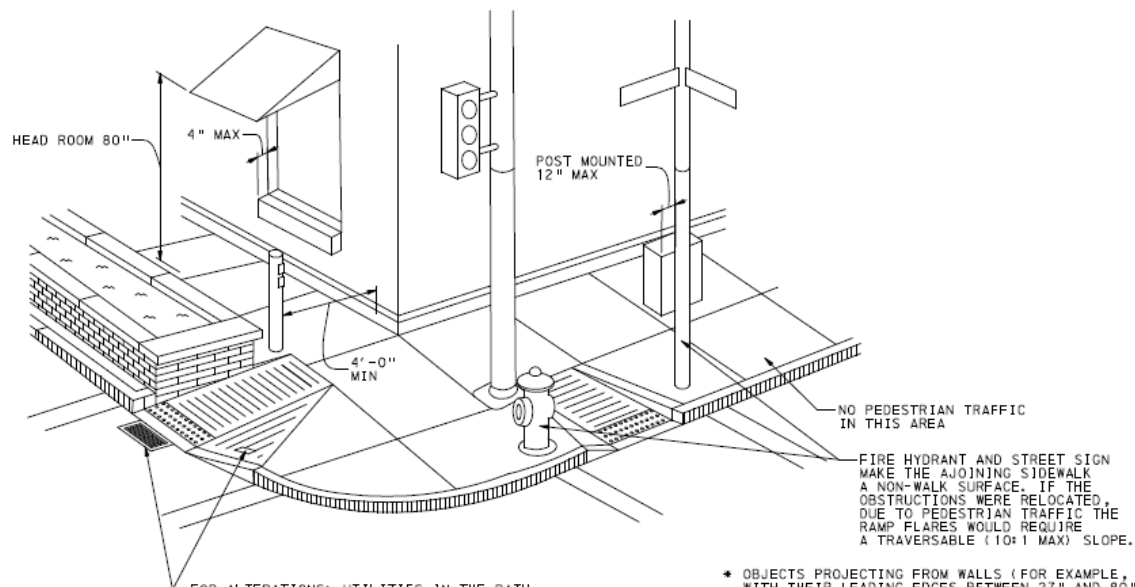
FOR NEW CONSTRUCTION: IF FEASIBLE LOCATE THE CURB RAMPS SO THAT THE UTILITIES ARE NOT IN THE PEDESTRIAN PATH OF TRAVEL.

REPLACE EXISTING GRATE WITH A GRATE WITH AN OPENING LESS THAN 1/2" IN DIRECTION OF TRAVEL. THE REPLACEMENT GRATE CAN NOT AFFECT INLET CAPACITY.

RECONFIGURE RAMPS TO UTILIZE TWO RAMPS AND AVOID EXISTING GRATE.

IF THE UTILITY AND ADJACENT SURFACE ELEVATION DIFFERENCE IS GREATER THAN 1/4", ADJUST UTILITY TO REMOVE GRADE DIFFERENCE.

POTENTIAL PROBLEM UTILITIES IN PEDESTRIAN PATH



FOR ALTERATIONS: UTILITIES IN THE PATH OF TRAVEL ARE ACCEPTABLE IF THE TOP SURFACE IS FLUSH, FIRM, STABLE AND SLIP RESISTANT. INLET GRATES MUST HAVE OPENINGS NO GREATER THAN 1/2" IN DIRECTION OF TRAVEL.

NEW CONSTRUCTION: AT CURB RAMPS, LOCATE UTILITIES SO THAT THEY ARE NOT IN THE PEDESTRIAN PATH OF TRAVEL.

* OBJECTS PROJECTING FROM WALLS (FOR EXAMPLE, TELEPHONES) WITH THEIR LEADING EDGES BETWEEN 27" AND 80" ABOVE THE FINISHED SURFACE SHALL PROTRUDE NO MORE THAN 4" INTO PEDESTRIAN WALKWAYS.

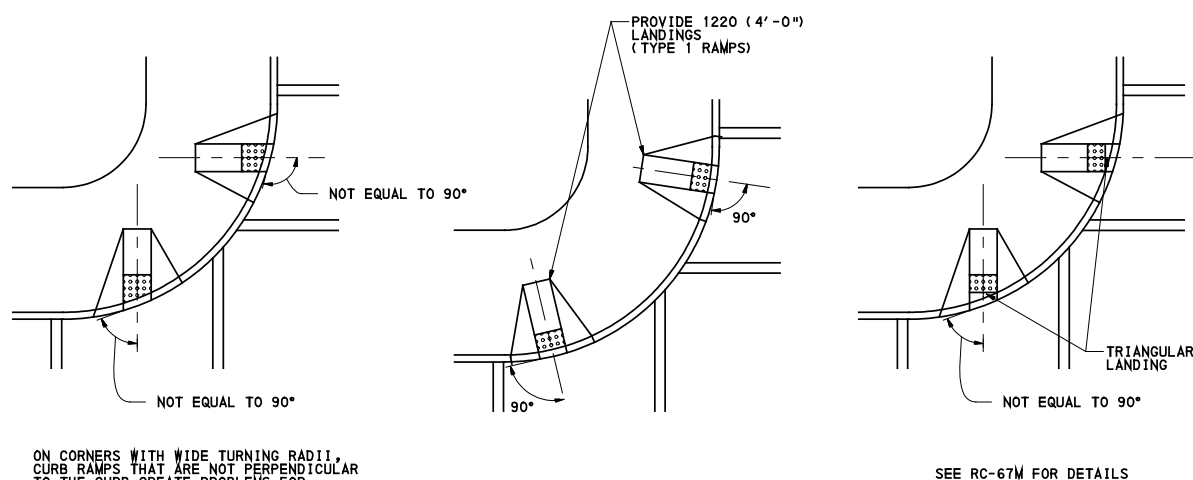
** OBJECTS MOUNTED WITH THEIR LEADING EDGES AT OR BELOW 27" ABOVE THE FINISHED SURFACE MAY PROTRUDE ANY AMOUNT.

*** OBJECTS MOUNTED ON POSTS OR PYLONS: OVERHANG 12" MAXIMUM FROM 27" TO 80" ABOVE THE GROUND OR FINISHED SURFACE.

**** PROTRUDING OBJECTS SHALL NOT REDUCE THE CLEAR WIDTH OF AN ACCESSIBLE ROUTE OR MANEUVERING SPACE.

UTILITIES AND VERTICAL OBSTRUCTIONS AT CURB RAMPS

FIGURE 6.10
Design Considerations:
Utilities in Path of Travel

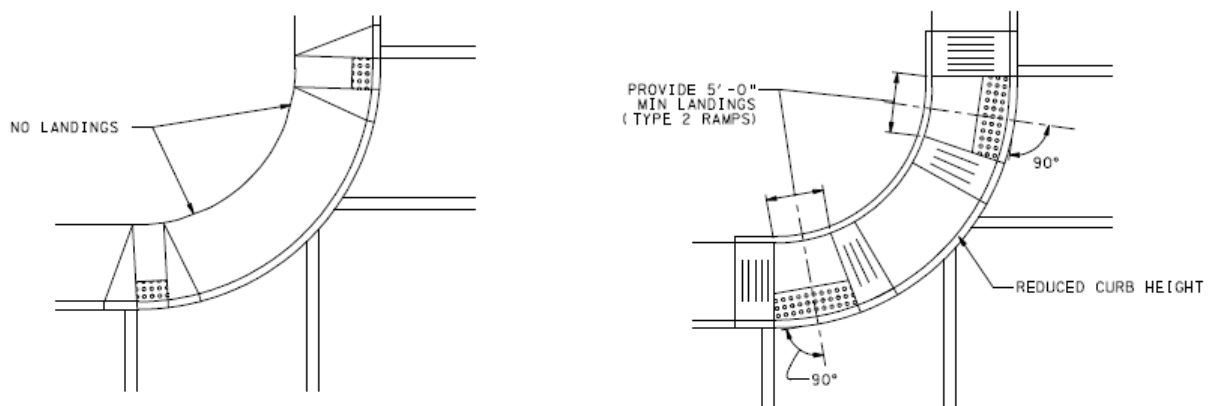


POTENTIAL PROBLEM
CURB RAMPS NOT PERPENDICULAR
TO CURB RETURNS

RECOMMENDATION
RECONSTRUCT RAMPS 90°
TO CURB RETURN

RECOMMENDATION
PROVIDE TRIANGULAR
LANDINGS AT THE BOTTOM
OF THE CURB RAMPS

FIGURE 6.11
Design Considerations:
Non-Perpendicular Type 1 Curb Ramps



POTENTIAL PROBLEM
TYPE 1 CURB RAMP
WITHOUT LANDINGS

RECOMMENDATION
RECONSTRUCT TYPE 2
AS PARALLEL RAMPS

FIGURE 6.12
Design Considerations:
Type 1 Curb Ramps Without Landings

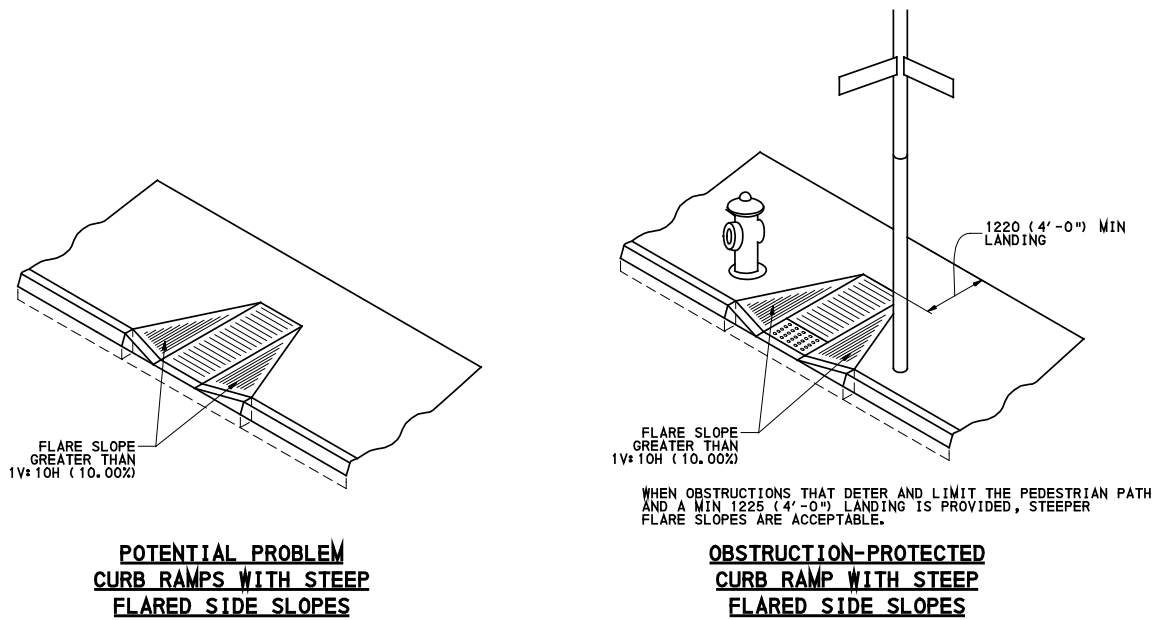
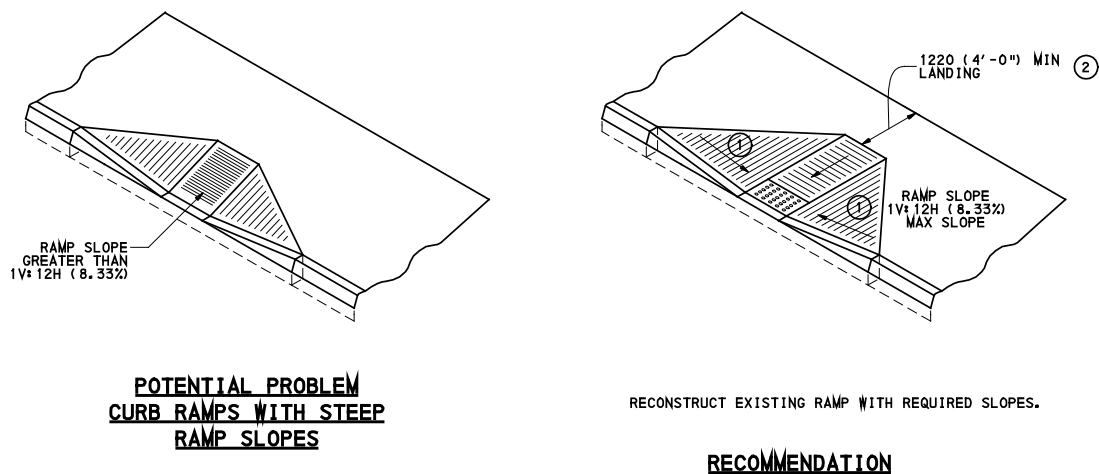


FIGURE 6.13
Design Considerations:
Steep Flares in PAR



- ① SIDE FLARES 1V:10H (10.00%) MAX
- ② SIDE FLARES 1V:12H (8.33%) MAX FOR RAMPS WITH A LANDING LESS THAN 1220 (4'-0").

FIGURE 6.14
Design Considerations:
Steep Curb Ramps

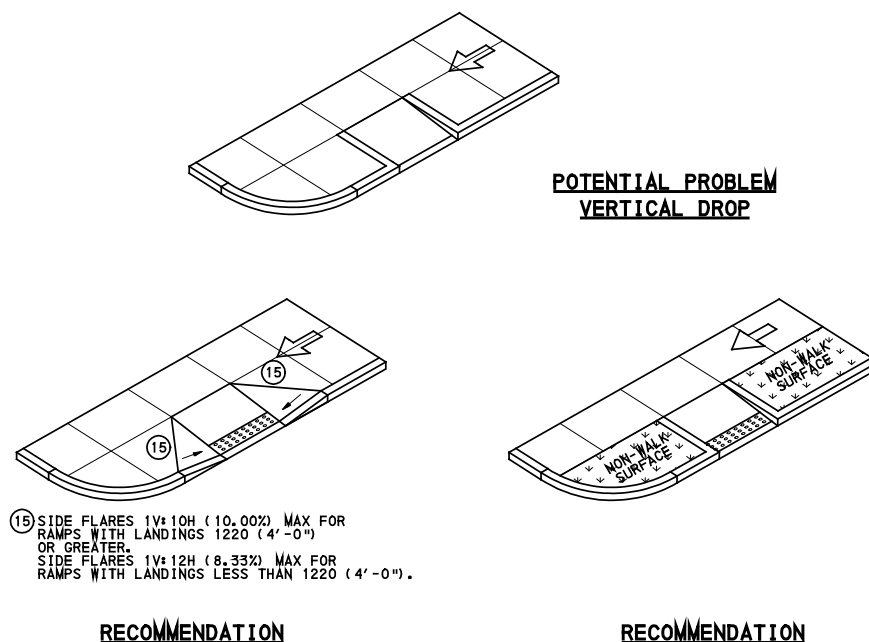


FIGURE 6.15
Design Considerations:
Vertical Drops in PAR

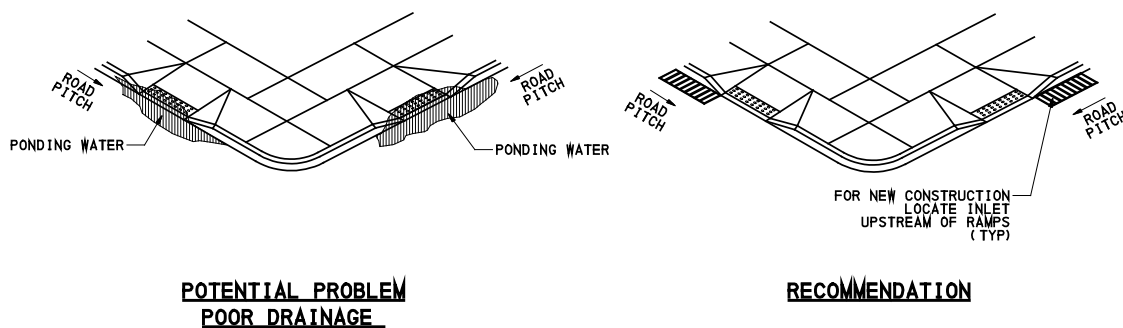
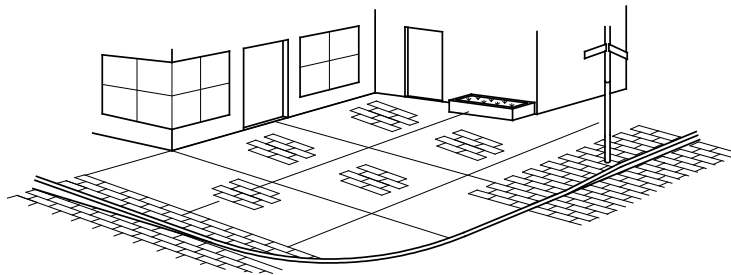
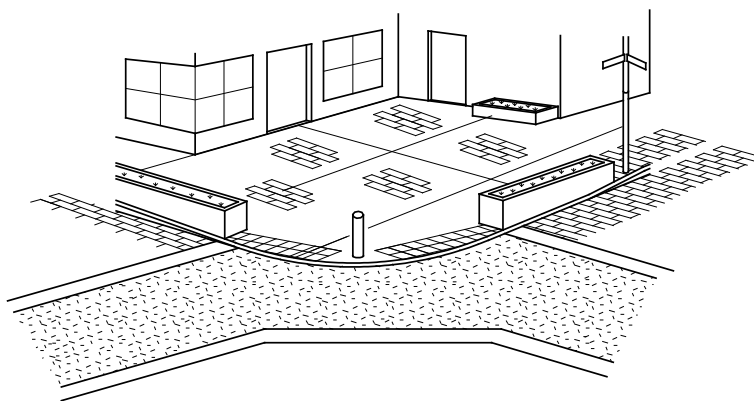


FIGURE 6.16
Design Considerations:
Ponding at Curb Ramps



DECORATIVE PATTERNS USED AT DEPRESSED CURBS, SUCH AS BRICK PATTERN, CREATE A CONTINUOUS PATHWAY. PEOPLE WITH VISION AND COGNITIVE IMPAIRMENTS HAVE DIFFICULTY DETECTING WHERE THE STREET BEGINS AND ENDS.

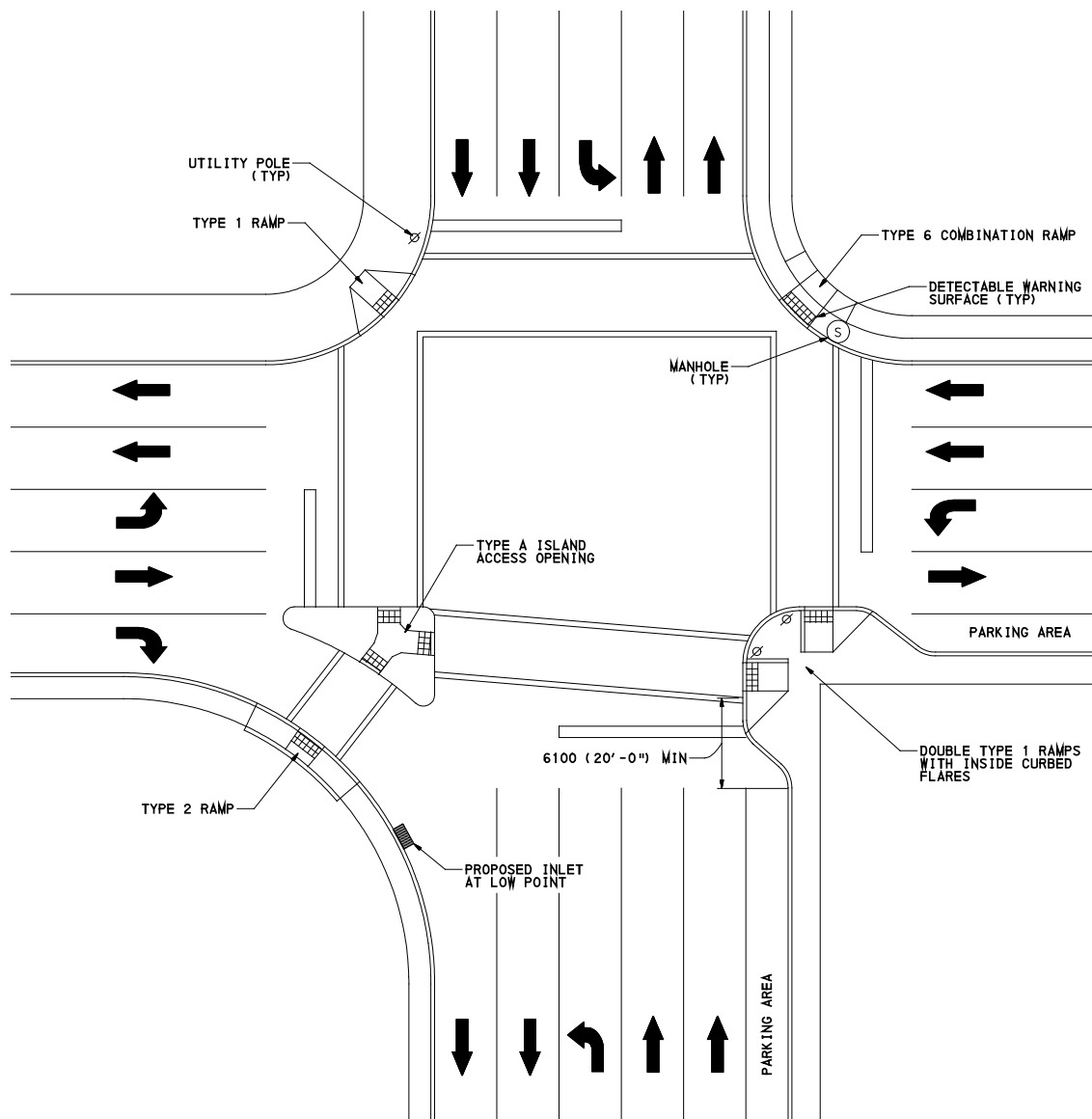
POTENTIAL PROBLEM **LARGE BLENDED TRANSITIONS**



DETECTABLE WARNING SURFACES, CONTRASTING SURFACE MATERIALS, AND BARRIER POSTS ARE MEASURES THAT CAN BE UTILIZED TO CONVEY THE TRANSITION BETWEEN STREET AND SIDEWALK AT DEPRESSED CORNERS. THIS CORNER WOULD BE A GOOD LOCATION FOR ACCESSIBLE SIGNALS.

RECOMMENDATION

FIGURE 6.17
Design Considerations:
Depressed Curb and Blended Transitions

**DESIGN CONSIDERATIONS:**

LOCATIONS OF DRAINAGE, UTILITY OR OTHER POSSIBLE OBSTRUCTIONS.

LOCATIONS OF PEDESTRIAN PUSH BUTTONS.

CROSSWALK LOCATIONS CLEARLY AND ACCURATELY SHOWN.

LOCATIONS OF LOWPOINTS AND FLOW LINE ELEVATIONS.

CURB RAMPS LEAD TO A 1220 (4'-0") MIN ACCESSIBLE PATH WITH A MAX 2.00% CROSS SLOPE.

CURB RAMP AND FLARE SLOPES CALCULATED BASED ON ROAD PITCH AND RECOMMENDED SLOPES.

DOCUMENTATION OF NOT MEETING DESIGN REQUIREMENTS IF NOT TECHNICALLY FEASIBLE.

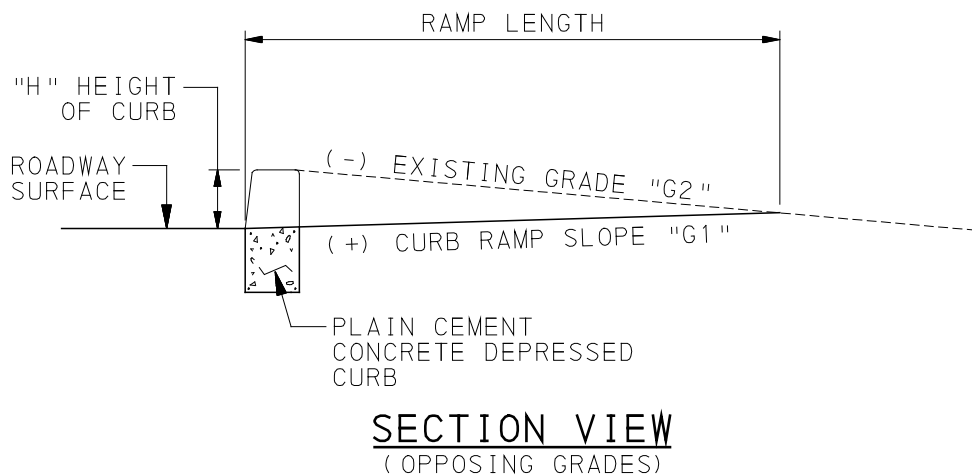
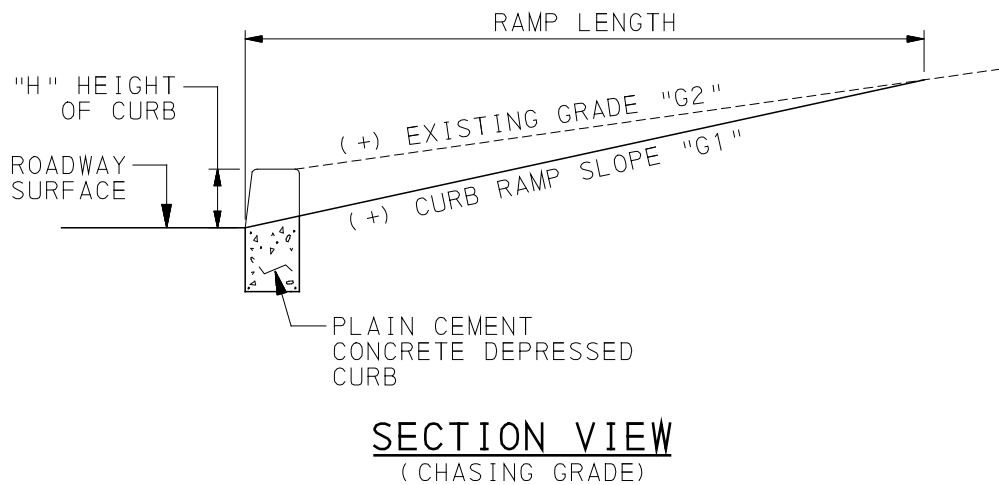
LEVEL OF DETAIL:

CURB RAMP AND FLARE EDGES ACCURATELY SHOWN.

DETECTABLE WARNING SURFACE CLEARLY AND ACCURATELY SHOWN.

CURB RAMP LOCATIONS AND TYPES CLEARLY IDENTIFIED.

FIGURE 6.18
Design Considerations:
Plan Details



To calculate ramp length:

"G1" Proposed Curb Ramp Slope (%)

"G2" Existing Grade (%)

"H" Height of Curb (ft)

$$\text{Ramp Length (ft)} = \frac{H}{(G1 - G2)/100}$$

Example #1 $\frac{0.67}{(5 - -3)} = 8.4'$

Example #2 $\frac{0.5}{(5-2)/100} = 16.7'$ Use
Steeper
Slope

FIGURE 6.19
Design Considerations:
Ramp and Flare Calculations

APPROXIMATE RAMP LENGTH (MM)														
"G1" 5% SLOPE														
		"H" CURB HEIGHT (MM)												
			25	50	75	100	125	150	175	200	225	250	275	300
"G2" EXISTING GRADE (%)	CHASING GRADE	12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		7	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		4	2500	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		3	1250	2500	3750	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2	834	1667	2500	3334	4167	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		1	625	1250	1875	2500	3125	3750	4375	n/a	n/a	n/a	n/a	n/a
		0	500	1000	1500	2000	2500	3000	3500	4000	4500	n/a	n/a	n/a
	OPPOSING GRADE	-1	417	834	1250	1667	2084	2500	2917	3334	3750	4167	n/a	n/a
		-2	358	715	1072	1429	1786	2143	2500	2858	3215	3572	3929	4286
		-3	313	625	938	1250	1563	1875	2188	2500	2813	3125	3438	3750
		-4	278	556	834	1112	1389	1667	1945	2223	2500	2778	3056	3334
		-5	250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
		-6	228	455	682	910	1137	1364	1591	1819	2046	2273	2500	2728
		-7	209	417	625	834	1042	1250	1459	1667	1875	2084	2292	2500
		-8	193	385	577	770	962	1154	1347	1539	1731	1924	2116	2308
		-9	179	358	536	715	893	1072	1250	1429	1608	1786	1965	2143
		-10	167	334	500	667	834	1000	1167	1334	1500	1667	1834	2000
		-11	157	313	469	625	782	938	1094	1250	1407	1563	1719	1875
		-12	148	295	442	589	736	883	1030	1177	1324	1471	1618	1765

Use the above chart to determine the approximate ramp length.

- Step 1: Find the appropriate curb height along the top row.
- Step 2: Follow the curb height down to the existing grade slope.
- Step 3: The intersecting value is the approximate ramp length at the given slope.
- Step 4: "n/a" indicates that a steeper slope must be used. The current slope produces a ramp length greater than 4500 mm.

FIGURE 6.20 (METRIC)
Design Considerations:
Ramp and Flare Length Charts

APPROXIMATE RAMP LENGTH (MM)														
"G1" 6% SLOPE														
		"H" CURB HEIGHT (MM)												
			25	50	75	100	125	150	175	200	225	250	275	300
"G2" EXISTING GRADE (%)	CHASING GRADE	12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		7	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		5	2500	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		4	1250	2500	3750	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		3	834	1667	2500	3334	4167	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2	625	1250	1875	2500	3125	3750	4375	n/a	n/a	n/a	n/a	n/a
		1	500	1000	1500	2000	2500	3000	3500	4000	4500	n/a	n/a	n/a
		0	417	834	1250	1667	2084	2500	2917	3334	3750	4167	n/a	n/a
	OPPOSING GRADE	-1	358	715	1072	1429	1786	2143	2500	2858	3215	3572	3929	4286
		-2	313	625	938	1250	1563	1875	2188	2500	2813	3125	3438	3750
		-3	278	556	834	1112	1389	1667	1945	2223	2500	2778	3056	3334
		-4	250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
		-5	228	455	682	910	1137	1364	1591	1819	2046	2273	2500	2728
		-6	209	417	625	834	1042	1250	1459	1667	1875	2084	2292	2500
		-7	193	385	577	770	962	1154	1347	1539	1731	1924	2116	2308
		-8	179	358	536	715	893	1072	1250	1429	1608	1786	1965	2143
		-9	167	334	500	667	834	1000	1167	1334	1500	1667	1834	2000
		-10	157	313	469	625	782	938	1094	1250	1407	1563	1719	1875
		-11	148	295	442	589	736	883	1030	1177	1324	1471	1618	1765
		-12	139	278	417	556	695	834	973	1112	1250	1389	1528	1667

Use the above chart to determine the approximate ramp length.

- Step 1: Find the appropriate curb height along the top row.
- Step 2: Follow the curb height down to the existing grade slope.
- Step 3: The intersecting value is the approximate ramp length at the given slope.
- Step 4: "n/a" indicates that a steeper slope must be used. The current slope produces a ramp length greater than 4500 mm.

FIGURE 6.20 (METRIC) (CONTINUED)
Design Considerations:
Ramp and Flare Length Charts

APPROXIMATE RAMP LENGTH (MM)															
"G1" 7% SLOPE															
		"H" CURB HEIGHT (MM)													
"G2" EXISTING GRADE (%)	CHASING GRADE		25	50	75	100	125	150	175	200	225	250	275	300	
		12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		7	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		6	2500	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		5	1250	2500	3750	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		4	834	1667	2500	3334	4167	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		3	625	1250	1875	2500	3125	3750	4375	n/a	n/a	n/a	n/a	n/a	n/a
		2	500	1000	1500	2000	2500	3000	3500	4000	4500	n/a	n/a	n/a	n/a
		1	417	834	1250	1667	2084	2500	2917	3334	3750	4167	n/a	n/a	n/a
	0	358	715	1072	1429	1786	2143	2500	2858	3215	3572	3929	4286		
	OPPOSING GRADE	-1	313	625	938	1250	1563	1875	2188	2500	2813	3125	3438	3750	
		-2	278	556	834	1112	1389	1667	1945	2223	2500	2778	3056	3334	
		-3	250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000	
		-4	228	455	682	910	1137	1364	1591	1819	2046	2273	2500	2728	
		-5	209	417	625	834	1042	1250	1459	1667	1875	2084	2292	2500	
		-6	193	385	577	770	962	1154	1347	1539	1731	1924	2116	2308	
		-7	179	358	536	715	893	1072	1250	1429	1608	1786	1965	2143	
		-8	167	334	500	667	834	1000	1167	1334	1500	1667	1834	2000	
		-9	157	313	469	625	782	938	1094	1250	1407	1563	1719	1875	
		-10	148	295	442	589	736	883	1030	1177	1324	1471	1618	1765	
		-11	139	278	417	556	695	834	973	1112	1250	1389	1528	1667	
-12		132	264	395	527	658	790	922	1053	1185	1316	1448	1579		

Use the above chart to determine the approximate ramp length.

- Step 1: Find the appropriate curb height along the top row.
- Step 2: Follow the curb height down to the existing grade slope.
- Step 3: The intersecting value is the approximate ramp length at the given slope.
- Step 4: "n/a" indicates that a steeper slope must be used. The current slope produces a ramp length greater than 4500 mm.

FIGURE 6.20 (METRIC) (CONTINUED)
Design Considerations:
Ramp and Flare Length Charts

APPROXIMATE RAMP LENGTH (MM)															
"G1" 8.33% SLOPE															
		"H" CURB HEIGHT (MM)													
"G2" EXISTING GRADE (%)	CHASING GRADE		25	50	75	100	125	150	175	200	225	250	275	300	
		12	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575
		11	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575
		10	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575
		9	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575
		8	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575
		7	1880	3760	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575
		6	1073	2146	3219	4292	4575	4575	4575	4575	4575	4575	4575	4575	4575
		5	751	1502	2253	3004	3754	4505	4575	4575	4575	4575	4575	4575	4575
		4	578	1155	1733	2310	2887	3465	4042	4575	4575	4575	4575	4575	4575
		3	470	939	1408	1877	2346	2815	3284	3753	4222	4575	4575	4575	4575
		2	395	790	1185	1580	1975	2370	2765	3160	3555	3950	4345	4575	4575
		1	342	683	1024	1365	1706	2047	2388	2729	3070	3411	3752	4093	4575
	0	301	601	901	1201	1501	1801	2101	2401	2702	3002	3302	3602	4575	
	OPPOSING GRADE	-1	268	536	804	1072	1340	1608	1876	2144	2412	2680	2948	3216	4575
		-2	243	485	727	969	1211	1453	1695	1937	2179	2421	2663	2905	4575
		-3	221	442	662	883	1104	1324	1545	1766	1986	2207	2428	2648	4575
		-4	203	406	609	812	1014	1217	1420	1623	1825	2028	2231	2434	4575
		-5	188	376	563	751	938	1126	1313	1501	1688	1876	2064	2251	4575
		-6	175	349	524	698	873	1047	1222	1396	1571	1745	1920	2094	4575
		-7	164	327	490	653	816	979	1142	1305	1468	1631	1794	1957	4575
		-8	154	307	460	613	766	919	1072	1225	1378	1531	1685	1838	4575
		-9	145	289	433	578	722	866	1010	1155	1299	1443	1587	1732	4575
		-10	137	273	410	546	682	819	955	1092	1228	1364	1501	1637	4575
		-11	130	259	388	518	647	776	906	1035	1164	1294	1423	1552	4575
-12		123	246	369	492	615	738	861	984	1107	1230	1353	1476	4575	

Use the above chart to determine the approximate ramp length.

- Step 1. Find the appropriate curb height along the top row.
- Step 2. Follow the curb height down to the existing grade slope.
- Step 3. The intersecting value is the approximate ramp length at the given slope.

FIGURE 6.20 (METRIC) (CONTINUED)
Design Considerations:
Ramp and Flare Length Charts

APPROXIMATE RAMP LENGTH (MM)													
"G1" 10% SLOPE													
		"H" CURB HEIGHT (MM)											
		25	50	75	100	125	150	175	200	225	250	275	300
"G2" EXISTING GRADE (%)	CHASING GRADE	12	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575
		11	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575
		10	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575
		9	2500	4575	4575	4575	4575	4575	4575	4575	4575	4575	4575
		8	1250	2500	3750	4575	4575	4575	4575	4575	4575	4575	4575
		7	834	1667	2500	3334	4167	4575	4575	4575	4575	4575	4575
		6	625	1250	1875	2500	3125	3750	4375	4575	4575	4575	4575
		5	500	1000	1500	2000	2500	3000	3500	4000	4500	4575	4575
		4	417	834	1250	1667	2084	2500	2917	3334	3750	4167	4575
		3	358	715	1072	1429	1786	2143	2500	2858	3215	3572	3929
		2	313	625	938	1250	1563	1875	2188	2500	2813	3125	3438
		1	278	556	834	1112	1389	1667	1945	2223	2500	2778	3056
		0	250	500	750	1000	1250	1500	1750	2000	2250	2500	2750
	OPPOSING GRADE	-1	228	455	682	910	1137	1364	1591	1819	2046	2273	2500
		-2	209	417	625	834	1042	1250	1459	1667	1875	2084	2292
		-3	193	385	577	770	962	1154	1347	1539	1731	1924	2116
		-4	179	358	536	715	893	1072	1250	1429	1608	1786	1965
		-5	167	334	500	667	834	1000	1167	1334	1500	1667	1834
		-6	157	313	469	625	782	938	1094	1250	1407	1563	1719
		-7	148	295	442	589	736	883	1030	1177	1324	1471	1618
		-8	139	278	417	556	695	834	973	1112	1250	1389	1528
		-9	132	264	395	527	658	790	922	1053	1185	1316	1448
		-10	125	250	375	500	625	750	875	1000	1125	1250	1375
		-11	120	239	358	477	596	715	834	953	1072	1191	1310
		-12	114	228	341	455	569	682	796	910	1023	1137	1250

Use the above chart to determine the approximate ramp length.

- Step 1: Find the appropriate curb height along the top row.
- Step 2: Follow the curb height down to the existing grade slope.
- Step 3: The intersecting value is the approximate ramp length at the given slope.

FIGURE 6.20 (METRIC) (CONTINUED)
Design Considerations:
Ramp and Flare Length Charts

APPROXIMATE RAMP LENGTH															
"G1" 5% SLOPE															
		"H" CURB HEIGHT (IN)													
"G2" EXISTING GRADE (%)	CHASING GRADE		1	2	3	4	5	6	7	8	9	10	11	12	
		12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		7	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		4	8.4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		3	4.2	8.4	12.5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2	2.8	5.6	8.4	11.2	13.9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		1	2.1	4.2	6.3	8.4	10.5	12.5	14.6	n/a	n/a	n/a	n/a	n/a	n/a
	0	1.7	3.4	5.0	6.7	8.4	10.0	11.7	13.4	15.0	n/a	n/a	n/a	n/a	
	OPPOSING GRADE	-1	1.4	2.8	4.2	5.6	7.0	8.4	9.8	11.2	12.5	13.9	n/a	n/a	n/a
		-2	1.2	2.4	3.6	4.8	6.0	7.2	8.4	9.6	10.8	12.0	13.1	14.3	
		-3	1.1	2.1	3.2	4.2	5.3	6.3	7.3	8.4	9.4	10.5	11.5	12.5	
		-4	1.0	1.9	2.8	3.8	4.7	5.6	6.5	7.5	8.4	9.3	10.2	11.2	
		-5	0.9	1.7	2.5	3.4	4.2	5.0	5.9	6.7	7.5	8.4	9.2	10.0	
		-6	0.8	1.6	2.3	3.1	3.8	4.6	5.4	6.1	6.9	7.6	8.4	9.1	
		-7	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0	7.7	8.4	
		-8	0.7	1.3	2.0	2.6	3.3	3.9	4.5	5.2	5.8	6.5	7.1	7.7	
		-9	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	6.6	7.2	
		-10	0.6	1.2	1.7	2.3	2.8	3.4	3.9	4.5	5.0	5.6	6.2	6.7	
		-11	0.6	1.1	1.6	2.1	2.7	3.2	3.7	4.2	4.7	5.3	5.8	6.3	
-12		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.4	5.9		

Use the above chart to determine the approximate ramp length.

- Step 1: Find the appropriate curb height along the top row.
- Step 2: Follow the curb height down to the existing grade slope.
- Step 3: The intersecting value is the approximate ramp length at the given slope.
- Step 4: "n/a" indicates that a steeper slope must be used. The current slope produces a ramp length greater than 15'-0".

FIGURE 6.20 (ENGLISH)
Design Considerations:
Ramp and Flare Length Charts

APPROXIMATE RAMP LENGTH														
"G1" 6% SLOPE														
		"H" CURB HEIGHT (IN)												
			1	2	3	4	5	6	7	8	9	10	11	12
"G2" EXISTING GRADE (%)	CHASING GRADE	12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		7	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		5	8.4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		4	4.2	8.4	12.5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		3	2.8	5.6	8.4	11.2	13.9	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		2	2.1	4.2	6.3	8.4	10.5	12.5	14.6	n/a	n/a	n/a	n/a	n/a
		1	1.7	3.4	5.0	6.7	8.4	10.0	11.7	13.4	15.0	n/a	n/a	n/a
		0	1.4	2.8	4.2	5.6	7.0	8.4	9.8	11.2	12.5	13.9	n/a	n/a
	OPPOSING GRADE	-1	1.2	2.4	3.6	4.8	6.0	7.2	8.4	9.6	10.8	12.0	13.1	14.3
		-2	1.1	2.1	3.2	4.2	5.3	6.3	7.3	8.4	9.4	10.5	11.5	12.5
		-3	1.0	1.9	2.8	3.8	4.7	5.6	6.5	7.5	8.4	9.3	10.2	11.2
		-4	0.9	1.7	2.5	3.4	4.2	5.0	5.9	6.7	7.5	8.4	9.2	10.0
		-5	0.8	1.6	2.3	3.1	3.8	4.6	5.4	6.1	6.9	7.6	8.4	9.1
		-6	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0	7.7	8.4
		-7	0.7	1.3	2.0	2.6	3.3	3.9	4.5	5.2	5.8	6.5	7.1	7.7
		-8	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	6.6	7.2
		-9	0.6	1.2	1.7	2.3	2.8	3.4	3.9	4.5	5.0	5.6	6.2	6.7
		-10	0.6	1.1	1.6	2.1	2.7	3.2	3.7	4.2	4.7	5.3	5.8	6.3
		-11	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.4	5.9
		-12	0.5	1.0	1.4	1.9	2.4	2.8	3.3	3.8	4.2	4.7	5.1	5.6

Use the above chart to determine the approximate ramp length.

- Step 1: Find the appropriate curb height along the top row.
- Step 2: Follow the curb height down to the existing grade slope.
- Step 3: The intersecting value is the approximate ramp length at the given slope.
- Step 4: "n/a" indicates that a steeper slope must be used. The current slope produces a ramp length greater than 15'-0".

FIGURE 6.20 (ENGLISH) (CONTINUED)
Design Considerations:
Ramp and Flare Length Charts

APPROXIMATE RAMP LENGTH														
"G1" 7% SLOPE														
		"H" CURB HEIGHT (IN)												
			1	2	3	4	5	6	7	8	9	10	11	12
"G2" EXISTING GRADE (%)	CHASING GRADE	12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		7	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		6	8.4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		5	4.2	8.4	12.5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		4	2.8	5.6	8.4	11.2	13.9	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		3	2.1	4.2	6.3	8.4	10.5	12.5	14.6	n/a	n/a	n/a	n/a	n/a
		2	1.7	3.4	5.0	6.7	8.4	10.0	11.7	13.4	15.0	n/a	n/a	n/a
		1	1.4	2.8	4.2	5.6	7.0	8.4	9.8	11.2	12.5	13.9	n/a	n/a
		0	1.2	2.4	3.6	4.8	6.0	7.2	8.4	9.6	10.8	12.0	13.1	14.3
	OPPOSING GRADE	-1	1.1	2.1	3.2	4.2	5.3	6.3	7.3	8.4	9.4	10.5	11.5	12.5
		-2	1.0	1.9	2.8	3.8	4.7	5.6	6.5	7.5	8.4	9.3	10.2	11.2
		-3	0.9	1.7	2.5	3.4	4.2	5.0	5.9	6.7	7.5	8.4	9.2	10.0
		-4	0.8	1.6	2.3	3.1	3.8	4.6	5.4	6.1	6.9	7.6	8.4	9.1
		-5	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0	7.7	8.4
		-6	0.7	1.3	2.0	2.6	3.3	3.9	4.5	5.2	5.8	6.5	7.1	7.7
		-7	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	6.6	7.2
		-8	0.6	1.2	1.7	2.3	2.8	3.4	3.9	4.5	5.0	5.6	6.2	6.7
		-9	0.6	1.1	1.6	2.1	2.7	3.2	3.7	4.2	4.7	5.3	5.8	6.3
		-10	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.4	5.9
		-11	0.5	1.0	1.4	1.9	2.4	2.8	3.3	3.8	4.2	4.7	5.1	5.6
		-12	0.5	0.9	1.4	1.8	2.2	2.7	3.1	3.6	4.0	4.4	4.9	5.3

Use the above chart to determine the approximate ramp length.

- Step 1: Find the appropriate curb height along the top row.
- Step 2: Follow the curb height down to the existing grade slope.
- Step 3: The intersecting value is the approximate ramp length at the given slope.
- Step 4: "n/a" indicates that a steeper slope must be used. The current slope produces a ramp length greater than 15'-0".

FIGURE 6.20 (ENGLISH) (CONTINUED)
Design Considerations:
Ramp and Flare Length Charts

APPROXIMATE RAMP LENGTH														
"G1" 8.33% SLOPE														
		"H" CURB HEIGHT (IN)												
			1	2	3	4	5	6	7	8	9	10	11	12
"G2" EXISTING GRADE (%)	CHASING GRADE	12	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
		11	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
		10	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
		9	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
		8	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
		7	6.3	12.6	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
		6	3.6	7.2	10.8	14.4	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
		5	2.6	5.1	7.6	10.1	12.6	15.0	15.0	15.0	15.0	15.0	15.0	15.0
		4	2.0	3.9	5.8	7.7	9.7	11.6	13.5	15.0	15.0	15.0	15.0	15.0
		3	1.6	3.2	4.7	6.3	7.9	9.4	11.0	12.6	14.1	15.0	15.0	15.0
		2	1.4	2.7	4.0	5.3	6.6	7.9	9.3	10.6	11.9	13.2	14.5	15.0
		1	1.2	2.3	3.5	4.6	5.7	6.9	8.0	9.1	10.3	11.4	12.6	13.7
		0	1.1	2.1	3.1	4.1	5.1	6.1	7.1	8.1	9.1	10.1	11.1	12.1
	OPPOSING GRADE	-1	0.9	1.8	2.7	3.6	4.5	5.4	6.3	7.2	8.1	9.0	9.9	10.8
		-2	0.9	1.7	2.5	3.3	4.1	4.9	5.7	6.5	7.3	8.1	8.9	9.7
		-3	0.8	1.5	2.3	3.0	3.7	4.5	5.2	5.9	6.7	7.4	8.1	8.9
		-4	0.7	1.4	2.1	2.8	3.4	4.1	4.8	5.5	6.1	6.8	7.5	8.2
		-5	0.7	1.3	1.9	2.6	3.2	3.8	4.4	5.1	5.7	6.3	6.9	7.6
		-6	0.6	1.2	1.8	2.4	3.0	3.5	4.1	4.7	5.3	5.9	6.4	7.0
		-7	0.6	1.1	1.7	2.2	2.8	3.3	3.9	4.4	4.9	5.5	6.0	6.6
		-8	0.6	1.1	1.6	2.1	2.6	3.1	3.6	4.1	4.6	5.2	5.7	6.2
		-9	0.5	1.0	1.5	2.0	2.5	2.9	3.4	3.9	4.4	4.9	5.3	5.8
		-10	0.5	1.0	1.4	1.9	2.3	2.8	3.2	3.7	4.1	4.6	5.1	5.5
		-11	0.5	0.9	1.3	1.8	2.2	2.6	3.1	3.5	3.9	4.4	4.8	5.2
		-12	0.5	0.9	1.3	1.7	2.1	2.5	2.9	3.3	3.7	4.1	4.6	5.0

Use the above chart to determine the approximate ramp length.

- Step 1. Find the appropriate curb height along the top row.
- Step 2. Follow the curb height down to the existing grade slope.
- Step 3. The intersecting value is the approximate ramp length at the given slope.

FIGURE 6.20 (ENGLISH) (CONTINUED)
Design Considerations:
Ramp and Flare Length Charts

APPROXIMATE RAMP LENGTH														
"G1" 10% SLOPE														
		"H" CURB HEIGHT (IN)												
			1	2	3	4	5	6	7	8	9	10	11	12
"G2" EXISTING GRADE (%)	CHASING GRADE	12	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
		11	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
		10	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
		9	8.4	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
		8	4.2	8.4	12.5	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
		7	2.8	5.6	8.4	11.2	13.9	15.0	15.0	15.0	15.0	15.0	15.0	15.0
		6	2.1	4.2	6.3	8.4	10.5	12.5	14.6	15.0	15.0	15.0	15.0	15.0
		5	1.7	3.4	5.0	6.7	8.4	10.0	11.7	13.4	15.0	15.0	15.0	15.0
		4	1.4	2.8	4.2	5.6	7.0	8.4	9.8	11.2	12.5	13.9	15.0	15.0
		3	1.2	2.4	3.6	4.8	6.0	7.2	8.4	9.6	10.8	12.0	13.1	14.3
		2	1.1	2.1	3.2	4.2	5.3	6.3	7.3	8.4	9.4	10.5	11.5	12.5
		1	1.0	1.9	2.8	3.8	4.7	5.6	6.5	7.5	8.4	9.3	10.2	11.2
		0	0.9	1.7	2.5	3.4	4.2	5.0	5.9	6.7	7.5	8.4	9.2	10.0
	OPPOSING GRADE	-1	0.8	1.6	2.3	3.1	3.8	4.6	5.4	6.1	6.9	7.6	8.4	9.1
		-2	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0	7.7	8.4
		-3	0.7	1.3	2.0	2.6	3.3	3.9	4.5	5.2	5.8	6.5	7.1	7.7
		-4	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	6.6	7.2
		-5	0.6	1.2	1.7	2.3	2.8	3.4	3.9	4.5	5.0	5.6	6.2	6.7
		-6	0.6	1.1	1.6	2.1	2.7	3.2	3.7	4.2	4.7	5.3	5.8	6.3
		-7	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.4	5.9
		-8	0.5	1.0	1.4	1.9	2.4	2.8	3.3	3.8	4.2	4.7	5.1	5.6
		-9	0.5	0.9	1.4	1.8	2.2	2.7	3.1	3.6	4.0	4.4	4.9	5.3
		-10	0.5	0.9	1.3	1.7	2.1	2.5	3.0	3.4	3.8	4.2	4.6	5.0
		-11	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0	4.4	4.8
		-12	0.4	0.8	1.2	1.6	1.9	2.3	2.7	3.1	3.5	3.8	4.2	4.6

Use the above chart to determine the approximate ramp length.

- Step 1: Find the appropriate curb height along the top row.
- Step 2: Follow the curb height down to the existing grade slope.
- Step 3: The intersecting value is the approximate ramp length at the given slope.

FIGURE 6.20 (ENGLISH) (CONTINUED)
Design Considerations:
Ramp and Flare Length Charts

6.10 CURB RAMP DESIGN REQUIREMENTS FOR ROADWAY INTERSECTIONS

A. Separate Curb Ramps or Single "Diagonal" Curb Ramp.

1. Two separate curb ramps (one curb ramp per crossing direction) must be used at each roadway intersection corner for all projects where technically feasible. This provides several advantages such as increased visibility, directional cues, decreased pedestrian crossing distance and does not require a wheelchair user to change direction when entering or leaving the curb ramp.

2. A single diagonal curb ramp (one curb ramp per two crossing directions at the middle of the curve) may be used where separate curb ramps are not feasible. Diagonal curb ramps are acceptable (with ADE of Design or delegate approval), provided crosswalks are constructed wide enough that a person in a wheelchair may enter either crosswalk from the ramp or the crosswalk markings provide a minimum 1220 mm (48 in) wide overrun clear zone at the bottom of the curb ramp. It is important to a visually impaired person using the sidewalk that the location of the curb ramps be as uniform as possible within a general area. See Publication 72M, *Roadway Construction Standards*, RC-67M for typical Type 1 curb ramp layouts at an intersection.

Diagonal curb ramps are not preferred and should be used sparingly in areas where pedestrian or vehicular traffic volumes are both moderate to high. Avoid using single ramps for large radius corner curbs. This type of location is less satisfactory for persons with visual disabilities since they are not useful to provide directional information about the crosswalk and may misdirect users.

Diagonal curb ramp locations also require pedestrians using wheelchairs to change direction when entering or leaving the curb ramp unless a diagonal intersection movement is allowed. The turning movement requires more time to cross the intersection and is performed where the pedestrian may be exposed to turning vehicular traffic.

When an existing diagonal curb ramp is altered, the existing diagonal curb ramps must be removed and replaced with separate curb ramps where technically feasible. Diagonal ramps will be acceptable for the following situations:

- Separate curb ramps cannot be installed to fully meet PennDOT standards; however, a diagonal ramp can be installed and fully meet PennDOT standards.
- When separate curb ramps would create a negative impact to:
 - Sight distance
 - Alignment with curb ramps on other side of street
 - Drainage/ponding
 - Relocated cross walk or stop bar locations would be undesirable
- Installation of separate curb ramps would require significant out of scope work that would stop construction or cancel project.
- Other factors as determined by the ADE of Design.

B. Pedestrian Crosswalk Location. Establish the inside pedestrian crosswalk lines by bisecting the intersection radii. The outside crosswalk lines may be placed close to the edge of the curb ramp if necessary. Sound engineering judgment is always necessary for minor adjustments in the curb ramp locations if the intersection has corners with varying radii or the corner is critical for ramp location.

C. Flares and Crosswalks. Single corner (Diagonal) Type 1 curb ramps must have at least a 610 mm (24 in) long segment of full height curb located on each side of the curb ramp between the flare and the nearest marked crosswalk lines.

D. Drainage. Curb ramps should not be located where pedestrians must cross drainage structures such as inlets and manholes. Design must consider both the location of the curb ramp and the location of the drainage structures in new construction. Locate additional drainage inlets on the upstream side of all curb ramps where applicable and locate curb ramps away from low points of the curb return.

6.11 CURB RAMP DESIGN CRITERIA

A. See PAR Requirements. [Section 6.5.](#)

B. Depressed Curb for Curb Ramps. The transition from curb ramp to adjacent sidewalks, streets or gutters, etc. must be flush and free of abrupt changes. For pedestrians using a wheelchair, a vertical lip at the depressed curb for curb ramps causes the pedestrian to exert additional force and may result in a backward direction fall. A vertical lip is acceptable and practical at depressed curb for driveways since it is not located within the PAR and only vehicles will travel across this change in elevation.

C. Curb Ramp Slopes. The least possible slope must be used for any curb ramp. However, the maximum curb ramp slope is 1V:12H (8.33%). Care should be taken to assure a uniform grade on the curb ramp free of sags and short grade changes. Position the ramp slope perpendicular to the curb to provide a grade break that may be approached perpendicularly. See [Figure 6.11](#). It may be necessary to limit the run of a parallel or perpendicular curb ramp in order to avoid chasing grade indefinitely when traversing the height of curb. Curb ramp length not to exceed 4500 mm (15 ft). Adjust the curb ramp slope as needed to provide access to the maximum extent feasible.

D. Curb Ramp Widths. Minimum width of a curb ramp is 1220 mm (48 in) exclusive of flared side slopes.

E. Flares Located Within Pedestrian Access Route. Curb ramp side flares positioned where pedestrians can walk across them must have flared sides with a maximum slope of 1V:10H (10.00%), measured parallel along the curb. If the level landing at the top of the curb ramp is less than 4 ft deep, flares shall be 8.33% maximum. It may be necessary to limit the length of a flare in order to avoid chasing grade indefinitely when traversing the height of curb. Flare length, measured along the curb, should not exceed 4500 mm (15 ft). Adjust flare slope as needed to provide access to the maximum extent feasible. See Publication 72M, *Roadway Construction Standards*, RC-67M details for additional information.

F. Flares and Return Curbs Located Outside of Pedestrian Circulation Path. In locations where pedestrians would not normally walk across the flare due to sidewalk obstructions such as street furniture, poles, fire hydrants, grass or tree lawns, return curbs may be used thereby eliminating the need for flared side slope surfaces (Type 4 and 4A curb ramps, see Publication 72M, *Roadway Construction Standards*, RC-67M). Note: Objects cannot be placed where they would affect clear zone or sight distance requirements.

G. Landing Requirements.

1. **Triangular Landings on Radial Curb.** If a curb ramp is not installed perpendicular to the curb, a triangular landing must be installed at the bottom of the curb ramp to provide an approach to the grade break. Installing the curb ramp in the same direction as the crossing provides a directional cue for pedestrians with visual disabilities. The detectable warning surface must be installed behind the grade break.

2. **Type 1 Curb Ramps.** For a Type 1 curb ramp a landing is required at the top of the curb ramp and is connected to the continuous passage. For alterations to existing facilities where site infeasibility precludes the 1220 mm (48 in) landing length at the top of the curb ramp and other curb ramp types do not provide adequate access, then a minimum 915 mm (36 in) landing length may be provided. When the Type 1 curb ramp top landing is less than 1220 mm (48 in), the slope of the side flares must be 1V:12H (8.33%) maximum.

H. Miscellaneous Requirements.

1. **Railings.** Curb ramps do not require handrails.

6.12 TRAFFIC CONTROL REQUIREMENTS

The requirements described herein may not fit all situations and cannot replace the need for the use of sound engineering judgment in the location and design of curb ramps and crosswalk markings. Although the written guidance in this Manual does not indicate that a diagonal curb ramp requires the installation of a crosswalk, as a

safety consideration, new crosswalk striping should be added to projects in medium to high pedestrian traffic areas to create the necessary clear space within the crosswalk configuration.

1. When the curb ramp is at the middle of curve (MC), the inside pedestrian crosswalk lines should be established by bisecting the intersecting radii and locating the crosswalk lines 1220 mm (48 in) from the MC as shown on the Standards for Roadway Construction.
2. Stop line markings should be used where it is important to indicate the point behind which vehicles are required to stop in compliance with a traffic signal, stop sign or other legal requirements. Markings should be placed 1220 mm (48 in) in advance of and parallel to the nearest crosswalk line.
3. For additional design guidance and recommendations with respect to pedestrian crosswalk markings, refer to the *MUTCD*.

6.13 PEDESTRIAN CROSSING CONTROLS

When provided, pedestrian-actuated crosswalk crossing controls on accessible routes must meet the following guidelines:

1. Controls must be raised from or flush with their housings and be a minimum of 50 mm (2 in) in the smallest dimension. The force required to activate the control must be no greater than 22 N (5 lb).
2. Controls must be located as close as practicable to the curb ramp serving the controlled crossing and permit operation from a clear ground space. Control location must not interfere with the movement of pedestrians on or across the curb ramp.
3. Controls must be a maximum height of 1065 mm (42 in) above the finished sidewalk surface.
4. A firm stable and slip resistant area with a minimum size of 1220 mm × 1220 mm (48 in × 48 in) must be provided to allow for a forward or parallel approach to the controls. Where a parallel approach is provided, controls must be within 255 mm (10 in) horizontally of and centered on the clear ground space. Where a forward approach is provided, controls must abut and be centered on the clear ground space.
5. Refer to the *MUTCD* for additional guidance.

6.14 TEMPORARY ALTERNATE CIRCULATION PATHS AT CONSTRUCTION SITES

Construction and alteration work within the public right-of-way that affects pedestrian circulation elements, spaces, or facilities must comply with the following provisions:

1. Construction or alterations affecting pedestrian pathways must require the provision of a safe, alternate and accessible pedestrian circulation path around the construction activities.
2. The alternate route must comply with all applicable design guidelines to the maximum extent feasible under existing conditions so that the usability of the accessible route is maintained.
3. The alternate route must be kept in place through the duration of the construction activity and must be clearly signed for pedestrian use. See Publication 213, *Temporary Traffic Control Guidelines*, PATA 40 and 41 and *MUTCD* Figures 6H-28 and 6H-29 for pedestrian notification signage for pedestrian route closings and detours.
4. The alternate route should be provided on the same side of the street as the disrupted route, to the maximum extent feasible. Where it is not feasible to provide a same-side alternate circulation path, detour the pedestrians to a similar level of accessible route as the disrupted route as close to the construction site as

possible. The detour circulation path may require the installation of temporary accessible pedestrian signals, curb ramps, or other accessibility facilities.

5. Walking surfaces must be firm, stable, slip-resistant, at least 1525 mm (60 in) wide and be maintained free of rubble or debris that would adversely affect the movement of persons with mobility problems. The width may be reduced to 1220 mm (48 in) if passing areas 1525 mm × 1525 mm (60 in × 60 in) are provided every 61 m (200 ft).
6. The alternate circulation path must be protected from construction activities, drop-offs, and vehicular traffic with approved pedestrian barricades or channelizing devices. The pedestrian barriers or channelizing devices must be continuous, stable and non-flexible and consist of a wall, fence, or enclosures specified in *MUTCD* Sections 6F.63, 6F.68 and 6F.71 with detectable, continuous bottom edge 150 mm (6 in) maximum height above the walkway surface.
7. The barricades and channelizing devices must also provide a continuous surface or upper rail at a 915 mm (36 in) minimum height above the walkway surface and toe rail at 150 mm (6 in) maximum height above the walkway surface. Support members may not protrude into the alternate circulation path. Sidewalk barriers should be detectable by blind pedestrians or those who have low vision. Plastic tape, movable cones, and print signs at a sidewalk excavation will not generally provide adequate notice or protection. Accessibility provisions for protruding objects and construction barrier criteria in the *MUTCD* offer helpful guidance in this area.
8. Protrusions into the alternate circulation path are not permitted.

6.15 TECHNICAL Q&A INFORMATION FOR ACCESSIBILITY ISSUES

These questions and answers are general in nature and may not be inclusive of the full scope of accessibility issues at a given site. All alteration project sites must be fully evaluated on a site by site basis to determine what accessibility issues should be included in the alteration work operations.

All curb ramp details in the 2010 ADA Standards, PROWAG and other approved reference sources that have developed various curb ramp types are indicated for new construction applications. There are few specific alteration construction details since there could be innumerable existing site conditions that could require detail adjustments. However, several alteration details have been added to Publication 72M, *Roadway Construction Standards*, RC-67M for certain accessibility situations. Each curb ramp alteration will require engineering adaptation to adjust the construction detail to the alteration site conditions.

The answers to these questions have been derived from several sources related to the ADA law, ADAAG standards, PROWAG and FHWA guidelines.

A. ADA Authority and Function.

1. Question - What's the difference between the ADA, ADA regulations and ADAAG?

Answer - The Americans with Disabilities Act (ADA) is a law passed in July 1990 that prohibits discrimination on the basis of disability. The statute required certain designated Federal agencies to develop implementing regulations, the first of which were promulgated in July of 1991. This rulemaking continues today. The regulations detail a wide range of administrative and procedural requirements, including compliance with design and construction standards; those standards are expressed in the Americans with Disabilities Act Accessibility Guidelines (ADAAG). ADAAG contains requirements for new construction and alterations. The U.S. Access Board develops the requirements as "guidelines" to serve as a basis for "standards" enforced by the Department of Justice (DOJ) and the Department of Transportation (US DOT). ADAAG derived from an earlier Federal standard, the Uniform Federal Accessibility Standards (UFAS). See [Section 6.2](#) for additional information.

2. Question – Is PennDOT responsible for all ADA curb ramps for all accessible routes within our highway right-of-way regardless of who has jurisdiction for an intersecting municipal street or roadway?

Answer - Pennsylvania law does not, as a rule, require PennDOT to construct sidewalks. The Department is permitted by Pennsylvania law to install sidewalks as a part of State funded projects under certain circumstances including the need to address the safety of pedestrian traffic. Generally, sidewalk installation is at the discretion of the Secretary and requires a formal agreement with the involved municipality or local government. The installation of a sidewalk is considered a "construction improvement" with repairs and maintenance being a local government responsibility.

Similarly, the legal responsibility for maintenance of pedestrian facilities beyond the curb line, with certain exceptions, lies with either the municipality or adjoining property owners. The curb ramp is a portion of the sidewalk system that allows ADA pedestrian accessibility across the roadway.

The ADA effectively preempted PA law regarding responsibility for areas beyond the curb line by attaching liability for construction of curb ramps to the "public entity" with the responsibility or authority over streets, roads or walkways. (PennDOT is responsible to provide curb ramps that cross state roadways and local municipalities are responsible to provide curb ramps that cross their streets and other roadways.)

The ADA did not, however, assign a maintenance obligation to the "public entity" installing the curb ramp. Therefore, PA law has not been preempted concerning maintenance obligations and PennDOT is not required to maintain a curb ramp behind the curb line even though we may have originally constructed the ramp to provide access across a municipal street or roadway. See [Section 6.6](#) for additional information.

3. Question - What is the public right-of-way?

Answer - The public right-of-way consists of everything between the right-of-way limits, including travel lanes, medians, planting strips, sidewalks and other facilities.

4. Question - What are the elements of an accessible design?

Answer - Public agencies have the choice of whether to follow the standards in the ADA Accessibility Guidelines (ADAAG) or the Uniform Federal Accessibility Standards (UFAS). Source: 28 CFR §35.151(c); (Appendix A to 28 CFR Part 36). *FHWA encourages public agencies to use ADAAG and the United States Access Board Public Rights-of-Way Accessibility Guidelines (PROWAG) as a best practice where the current standard, ADAAG, is silent or inapplicable, according to a February 2006 Federal Highway Administration (FHWA) Memorandum.* Under the ADAAG standards, an accessible design to a highway, street, or walkway includes accessible sidewalks and curb ramps with detectable warnings. Source: 28 CFR §35.151(c) and (e) (curb ramps), ADAAG 4.3-4.5 (accessible routes), 4.7 (curb ramps with detectable warnings), 4.29 (detectable warnings). Continuously maintained sidewalks are required by the case of *Barden v. City of Sacramento*, 292 F.3d 1073 (9th Cir. 2002), cert. denied, 123 S.Ct. 2639 (2003).

Accessible pedestrian signals and signs must be considered, with a reasonable and consistent plan to facilitate safe street crossings. Source: 28 CFR §35.151(c); 23 U.S.C. §217(g)(2). See [Section 6.2](#) for additional information.

5. Question - When should accessible design elements be incorporated into projects in the public right-of-way?

Answer - FHWA encourages the consideration of pedestrian needs in all construction, reconstruction and rehabilitation projects. If a public agency provides pedestrian facilities, those facilities must be accessible to persons with disabilities. A public agency is not relieved of its obligation to make its pedestrian facilities accessible if no individual with a disability is known to live in a particular area. This is true regardless of its funding source. Source: DOJ's ADA Title II Technical Assistance Manual, § II-5.1000, 1993. See [Section 6.0](#) for additional information.

6. Question - What should a public agency do when it does not control all of the public right-of-way required to provide access for persons with disabilities?

Answer - The public agency should work jointly with all others with interests in the highway, street, or walkway to ensure that pedestrian access improvements occur at the same time as any alteration or new project. The ADA encourages this cooperation by making each of the public agencies involved subject to complaints or lawsuits for failure to meet the ADA and Section 504 requirements. Source: 28 CFR §§ 35.170 – 35.178. See [Section 6.2.B](#) for additional information.

7. Question - Does the ADA permit an individual with a disability to sue when that individual believes that discrimination is about to occur, or must the individual wait for the discrimination to occur?

Answer - The ADA permits an individual to allege discrimination based on a reasonable belief that the planned construction or alteration of a place of public accommodation, such as curb ramps, have not been adequately provided at public sidewalk crossings of a street or are non-conforming to the ADAAG. The resolution of such challenges prior to the construction of a facility is encouraged to enable any necessary remedial measures to be incorporated during the planning, design, or construction stages, when such changes can be more readily addressed. FHWA has federal oversight authority for the investigation of transportation related ADA issues.

8. Question - What projects must provide pedestrian access for persons with disabilities?

Answer - Any project for construction or alteration of a facility that provides access to pedestrians must be made accessible to persons with disabilities. Source: 42 U.S.C. §§ 12131 - 12134; 28 CFR §§ 35.150, 35.151; *Kinney v. Yerusalim*, 9 F.3d 1067 (3d Cir. 1993), cert. denied, 511 U.S. 1033 (1994). See [Section 6.2](#) for additional information.

9. Question - How does cost factor into a public agency's decision in its transition plan concerning which existing facilities must comply with ADA and Section 504 pedestrian access requirements?

Answer - For existing facilities requiring accessibility improvements as scheduled in the transition plans, the public agency must provide accessibility improvements unless the cost of the upgrades is unduly burdensome. The test for being unduly burdensome is the proportion of the cost for accessibility improvements compared to the agency's overall budget, not simply the project cost. Source: 28 CFR Part 35, App. A, discussion at §35.150, ¶¶ 4 – 7.

The decision that pedestrian access would be unduly burdensome must be made by the head of a public agency or that official's designee, accompanied by a written statement of the reasons for the decision. Source: 28 CFR §35.150(a)(3).

10. Question - Can cost be a reason not to complete an ADA-required accessibility improvement for a new project planned outside of the transition plan, with ADA accessibility improvements required to make the facility readily accessible and usable by individuals with disabilities?

Answer - No. Cost may not be a reason to fail to construct or delay constructing a new facility so that the facility is readily accessible to and usable by persons with disabilities under the ADAAG standards. Source: 28 CFR §35.151(a); see DOJ Technical Assistance Manual for Title II of the ADA, II-6.3100(3). See [Section 6.2.B.4](#) for additional information.

11. Question - Can cost be a reason to decide what ADA-required improvements will be completed for an alteration project planned outside of the transition plan, with ADA accessibility improvements required within the scope of the project?

Answer - No. Cost may not be a reason for a public entity to fail to complete an ADA-required improvement within the scope of an alteration project under the ADAAG standards. A public agency must complete any ADA-required accessibility improvements within the scope of an alteration project to the maximum extent feasible. Source: 28 CFR §35.151(b); DOJ Technical Assistance Manual for Title II of the ADA, II-6.3100(4). See [Section 6.2.B.4](#) for additional information.

12. Question - Can a public agency delay compliance with the ADA and Section 504 on alteration projects through a systematic approach to schedule the project?

Answer - No. All pedestrian access upgrades within the scope of the project must occur at the same time as the alteration. Source: *Kinney v. Yerusalim*, 9 F.3d 1067 (3d Cir. 1993), cert. denied, 511 U.S. 1033 (1994). See [Section 6.2.B](#) for additional information.

B. General Design Criteria.**1. Question - Are handrails required for curb ramps?**

Answer - Handrails are not required on curb ramps. (ADAAG Section 4.8.5)

2. Question - Is there a minimum landing width requirement at the top of a curb ramp? ADAAG Figure 12 shows a dimension "X" that is related to the slope of the side flares, but does not indicate a minimum.

Answer - The ADAAG minimum landing width at the top of a curb ramp is 915 mm (36 in). PROWAG minimum landing requires a minimum of 1220 mm (48 in). It should be noted, Publication 72M, *Roadway Construction Standards*, RC-67M depicts a 1220 mm (48 in) minimum landing. A curb ramp is part of the accessible route and must maintain a maximum 1V:50H (2.00%) cross slope. Where pedestrians perform turning maneuvers, a level landing [1V:50H (2.00%) maximum longitudinal and cross slope in any direction] is required.

Figure 12 in the ADAAG is not intended to represent all of the requirements for curb ramps. The actual requirements are contained in the text of the technical specifications (ADAAG 4.3.3 & 4.7.1). See [Section 6.11.G](#) for additional information.

3. Question - Does a level landing mean a zero percent slope?

Answer - The requirement for level landings refers to ramps (ADAAG Section 4.8.5) and does not refer specifically to curb ramps. In general, "level" means having a slope no greater than 1V:50H (2.00%) in longitudinal and cross slope. Landings at the top of curb ramps are generally part of a sidewalk configuration and are permitted to have a maximum cross slope of 1V:50H (2.00%) to allow for drainage to avoid the accumulation of water on the sidewalk. Any cross slopes on sidewalks and other ground surfaces can cause considerable difficulty in maneuvering a wheelchair in a straight line. See [Section 6.1](#) for additional information.

4. Question - Are curb ramps required to have detectable warnings?

Answer - Originally, ADAAG required detectable warnings, a distinctively bumpy surface (truncated dome) detectable by cane and underfoot, on the entire surface of curb ramps to provide a tactile cue for persons with vision impairments of their approach to streets. This warning was required since the sloped surfaces of curb ramps remove a tactile cue provided by curb faces. The U.S. Access Board temporarily suspended these requirements for curb ramps in 1994 due to concerns raised about the technical specifications, the availability of complying products, snow and ice removal maintenance issues, usefulness and safety. DOJ and US DOT joined in this action, which effectively removed the requirement from the enforceable standards. The suspension was extended twice (in 1996 and 1998) to accommodate the review and update of ADAAG. The ADAAG Review Advisory Committee recommended that the issue of detectable warnings at curb ramps should be resolved specifically in relation to public rights-of-ways before reinstating any requirements in ADAAG, which specifically now applies to facilities on sites. The Board agreed and did not include requirements for detectable warnings at curb ramps in its update of ADAAG. Consequently, the Board did not further extend the suspension, which expired on July 26, 2001. Since the enforcing agencies did not also extend the suspension, the detectable warning requirements *are technically part of the standards again*. New guidelines have been developed and will be presented for public street curb ramps in a forthcoming guideline covering public rights-of-way (PROW). Publication 72M, *Roadway Construction Standards*, RC-67M has been revised to incorporate the new truncated dome dimensions and alignment. See [Section 6.5.A.8](#) for additional information.

5. Question - Some older curb ramps have grooved or other textured surface treatments that were to make them detectable by persons with visual impairments or create a slip-resistance surface. Are these surfaces acceptable as the detectable warning strip requirement on curb ramps and other hazardous vehicular crossings?

Answer - No. A number of other textured surfaces have been used on curb ramps, but they have not been demonstrated to be highly detectable to pedestrians who are blind, both underfoot and by the use of a long cane. Grooved cement has been found to be minimally detectable to people using a long cane as a travel aid and it is even less detectable underfoot. Other decorative surfaces that may be assumed to be detectable have not been tested for detectability. Many surfaces that look like they should be highly detectable have been found to be low in detectability. Consistency in a warning surface is essential if it is to reliably be understood as a warning by pedestrians with visual impairments. The truncated dome texture specified in ADAAG (4.29.2) is the only surface that should be considered a detectable warning. See [Section 6.5.A.8](#) for additional information.

6. Question - The truncated dome warning surface is to cover the entire surface of the curb ramp in the original ADAAG. Why has this requirement been changed to require only a 610 mm (2 ft) wide strip at the bottom of the curb ramp?

Answer - The change was made to reflect the width of detectable warning strips required at transit platform edges (ADAAG 1991). The rationale for the 610 mm (2 ft) width of detectable warnings has been repeatedly demonstrated to be a sufficient width of a surface highly detectable both underfoot and by use of a long cane, to enable detection and stopping on that surface by most blind travelers. A longer width of the detectable surface can confuse pedestrians that have become accustomed to the shorter requirement and mislead them as to where the edge of the street is actually located.

7. Question - Why has the alignment of the truncated domes been changed? Is the older arrangement of domes on an existing curb ramp still in compliance with the ADA?

Answer - The desired current arrangement of the rows of domes is to be aligned with the path of wheelchair travel and perpendicular to the grade break at the toe of the ramp. Pedestrians encountering either configuration will find the surface pattern equally detectable and the older alignment is still in compliance with ADAAG. See [Section 6.5.A.8.b](#) for additional information.

8. Question - Do sidewalk crossings of residential driveways require detectable warning surfaces on either side of the driveway?

Answer - No. Generally sidewalk crossings of residential driveways will not be provided with detectable warnings, since the pedestrian right-of-way continues across most driveway aprons and overuse of detectable warning surfaces should be avoided in the interest of message clarity for persons with visual impairments. See [Section 6.5.A.8](#) for additional information.

9. Question - Do sidewalk crossings of commercial driveways require detectable warnings?

Answer - Yes, in certain situations. Where commercial driveways are provided with traffic control devices or otherwise are permitted to operate like public streets, detectable warnings should be provided at the junction between the pedestrian route and the commercial driveway. See [Section 6.5.A.8](#) for additional information.

10. Question - Must the dimensions indicated in ADAAG be precisely met?

Answer - Yes. Dimensions that are not marked minimum or maximum are absolute, unless otherwise indicated in the text or captions.

11. Question - Must the bottom of the curb ramp at the depressed curb line be flush with the adjacent roadway surface? Doesn't ADAAG allow for a 6 mm (0.25 in) vertical rise?

Answer - The ADAAG specifically states that the transition from curb ramps to walks, gutter or streets must be flush and free of abrupt changes. Any lip at the transition area can cause disruption to wheelchair movement since the small front wheels (casters) swivel freely. When the casters hit a raised lip, they swivel sideways and stop rolling. ADAAG does allow (Section 4.5.2) vertical changes in level up to 6 mm (0.25 in) without edge treatment *along an accessible route*, but the requirement for curb ramp transition to an adjacent surface requires a flush transition. See [Section 6.11.B](#) for additional information.

12. Question - Is environmental documentation required for curb ramps during resurfacing projects?

Answer - That is a decision that must be made based on the overall scope of the alteration project. Publication 10B, Design Manual, Part 1B, *Post-TIP NEPA Procedures*, provides two CE actions that should cover this work if there is no additional right-of-way required in the project. Resurfacing is covered by a Level 1b CE Action #1 - modernization of a highway by resurfacing. Curb ramps are covered by a Level 1a CE Action #3 - Construction of bicycle and pedestrian lanes, paths and facilities and #15 - Alterations to facilities or vehicles in order to make them accessible for the elderly and handicapped persons.

A Level 1a CE is approved by the District Environmental Manager. A Level 1b CE is approved by the District Executive.

13. Question - If the intersection is provided with crosswalks must the curb ramp be inside the crosswalk lines?

Answer - The curb ramps at indicated crosswalks must be contained within the crosswalk lines. For ramps that serve only one crosswalk direction, the flares may be placed outside of the crosswalk. For diagonal ramps that serve two crosswalk directions, the flares must be inside of the crosswalk lines. See Publication 72M, *Roadway Construction Standards*, RC-67M for details.

14. Question - Do pedestrian sidewalk crossings of curbed alleys require curb ramps?

Answer - Yes. Detectable warnings should be provided at the junction between the pedestrian route and the alley. All pedestrian crossings of a curbed roadway must be provided with accessible curb ramps complete with detectable warning surfaces since the alley represents a hazard in the line of travel for pedestrians who are visually impaired. See [Section 6.5.A.8](#) for additional information.

15. Question - Should detectable warning surfaces be placed at sidewalk crossings of alleys that are at the same elevation as the sidewalk?

Answer - Yes. Detectable warnings should be provided at the junction between the pedestrian route and the alley. The sidewalk crossing of the alley presents a hazardous condition and the detectable warning surface alerts pedestrians who are visually impaired to the presence of hazards in the line of travel, indicating that they should stop and determine the nature of the hazard before proceeding further.

Also from Public Rights of Way (PROW) - Advisory R221 Detectable Warning Surfaces. "Detectable warning surfaces are required where curb ramps, blended transitions, or landings provide a flush pedestrian connection to the street." See [Section 6.5.A.8](#) for additional information.

16. Question - Are existing ADA accessibility facilities constructed under previous ADA criteria required to be upgraded every time new accessibility criteria are issued?

Answer - No. Existing ADA accessibility facilities are not required to be upgraded every time new accessibility criteria are issued. However, upgrading to new criteria would be required when the existing accessibility feature is located within the project scope or limits of work of various types of alteration projects or in new construction. See [Section 6.2.C](#) for additional information.

C. Elements of Accessible Design - Alterations.**1. Question - What projects constitute an alteration to the public right-of-way?**

Answer - An alteration is a change to a facility in the public right-of-way that affects or could affect access, circulation, or use. Projects altering the use of the public right-of-way must incorporate pedestrian access improvements within the scope of the project to meet the requirements of the ADA and Section 504. These projects have the potential to affect the structure, grade, or use of the roadway. Alterations include items such as reconstruction, major rehabilitation, widening, resurfacing (e.g., overlays and mill and fill), signal installation and upgrades and projects of similar scale and effect. See [Section 6.1](#) for additional information.

2. Question - When does the scope of an alteration project trigger accessibility improvements for people with disabilities?

Answer - The scope of an alteration project is determined by the extent the alteration project directly changes or affects the public right-of-way within the project limits. The public agency must improve the accessibility of only that portion of the public right-of-way changed or affected by the alteration. If a project resurfaces the

street for accessibility purposes, the curb ramps, and pavement at the pedestrian crosswalk are in the scope of the project, but the sidewalks are not. Any of the facilities disturbed by the construction must be replaced so that they are accessible. All remaining access improvements within the public right-of-way must occur within the schedule provided in the public agency's planning process. See [Section 6.2.B](#) for additional information.

3. Question - Can my alteration project decrease or have the effect of decreasing ADA accessibility below the requirements of new construction at the time of the alteration?

Answer - No. No alteration project should be undertaken which would decrease or have the effect of decreasing accessibility or utilization of an ADA feature or facility. However, if compliance with ADA standards is *technically infeasible*, the alteration must provide accessibility to the maximum extent feasible within the scope of the alteration. See [Section 6.9.D.5](#) for additional information.

4. Question - What if the ADA standards do not indicate specific details applicable for my alteration site or where full compliance to the standards would be technically infeasible?

Answer - Where ADA standards do not include detailed provisions for a specific alteration situation, the designer must determine what constitutes accessible design based on sound engineering judgment to utilize the current standards and provide accessibility to the maximum extent feasible. See [Section 6.9.F](#) for additional information.

5. Question - How can *technically infeasible* be better understood? Do utility and right-of-way impacts meet the definition of technically infeasible?

Answer - The highest degree of accessibility is expected in new construction. Alterations to existing facilities must observe new construction criteria where technically feasible; less stringent technical specifications may be applied where technical infeasibility is encountered. Existing facilities must achieve a level of usability that balances user needs, the constraints of existing conditions and the resources available for remedial work.

Alterations constrained by work already in place, may default to an intermediate standard when structural and site conditions prohibit full accessibility. Existing facilities must provide access to the maximum extent possible, a flexibility that permits needs to be balanced against available resources. If the alteration project scope of work involves utility relocations or additional right-of-way acquisition at the location of the pedestrian facilities, then new construction standards should be utilized. If the project scope of work does not require utility relocations or acquisition of additional right-of-way, then those elements can be considered as being constraining features or technically infeasible site conditions.

6. Question - What role does the "maximum extent feasible" standard play for ADA accessibility requirements in altered projects?

Answer - In an alteration project, the public agency must incorporate the ADA accessibility standards to the maximum extent feasible. Source: 28 CFR §35.151(b). The feasibility meant by this standard is physical possibility only. A public agency is exempt from meeting the ADA standards in the rare instance where physical terrain or site conditions restrict constructing or altering the facility to the standard. Source: ADA Accessibility Guidelines 4.1.6(1)(j).

Cost is not a factor in determining whether meeting standards has been completed to the maximum extent feasible. Source: DOJ's ADA Title II Technical Assistance Manual, § II-6.3200(3)-(4), 1993. *No particular decision making process is required to determine that an accessibility improvement is not technically feasible, but the best practice is to document the decision to enable the public agency to explain the decision in any later compliance review.* See [Section 6.2.B.4](#) for additional information.

7. Question - Can flush mounted utility valve boxes, junction boxes, manholes, etc. be located in a curb ramp surface, side flare, or landing?

Answer - Yes, existing utilities may be located within the pedestrian access route, if necessary. However, the box cover or manhole surface must be stable, firm, slip-resistant and flush with the adjacent surface. Proposed utilities must be placed outside of the pedestrian access route. See [Section 6.5.B](#) for additional information.

8. Question - Can utility, signal, or sign poles, fire hydrants, etc. be located in curb ramp side flares as long as lateral clearances for accessibility are met?

Answer - If necessary, yes. All attempts to relocate vertical obstructions to provide full accessibility should be attempted and easy to relocate features such as a sign pole can be readily relocated in most cases without adversely affecting its function on the street. There is no provision in the ADA to require moving existing utilities or acquiring new right-of-way for alteration work.

There are also several curb ramp design types that do not feature side flares that may be utilized to meet existing site conditions and help to prevent keeping poles or other undesired features from being located in the pedestrian curb ramp walkway. Side flare curb ramp types are generally utilized where pedestrians would have the need to laterally cross the ramp or for a wheelchair to make a turning movement. Providing appropriate lateral accessibility clearance** at a pole (post, fire hydrant, street tree, etc.) location would be necessary. Curb ramps with returned curbs may be used where pedestrian traffic would not normally be expected to walk across the ramp.

** The minimum clear width ground space for an accessible route for single point access is 815 mm (32 in), for a maximum length of 24 in, to accommodate single wheelchair passage (ADAAG 4.2.1). The remainder of the accessible route is 915 mm (36 in) minimum clear width (ADAAG 4.3.3). PROWAG requires a minimum 1220 mm (48 in) pedestrian access route. Recommended guideline: The **1220 mm (48 in) dimension should be used** as the desired minimum single point access dimension whenever possible due to the probability of multiple pedestrians. Pedestrian access route should not be confused with sidewalk width.

Alteration projects that include the installation of or relocation of poles, posts, street trees, fire hydrants, or other types of street furniture on or near existing pedestrian pathways must provide the required accessibility clearances designated for a pedestrian access route. See [Section 6.5.B](#) for additional information.

9. Question - New curb ramps are being installed at an existing developed corner. New construction standards require the curb ramp to be within the crosswalk, but an existing underground utility vault is located where the ramp should be. Must the utility vault be moved?

Answer - The scope of the project will determine the answer. If utilities are being moved for other reasons within the project limits, it may be possible to alter or relocate the vault. If project construction will not involve the vault, it may be technically infeasible to position the curb ramp at an optimal location. It may also be possible to widen the crosswalk markings to include the curb ramp.

10. Question - What if the curb ramp can be placed over the vault, but the access cover would be located on the curb ramp?

Answer - If the access cover must be located on the curb ramp, it should meet the surface requirements of the pedestrian access route (stable, firm, slip-resistant and flush with the adjacent surface). See [Section 6.5.B](#) for additional information.

11. Question - If existing diagonal curb ramps are present or proposed, should crosswalk striping be included in the project?

Answer - Diagonal curb ramps should be proposed sparingly in areas where pedestrian traffic is moderate to high. All curb ramps are to have a minimum 1220 mm (48 in) clear space (overrun area) on the street at the bottom of the curb ramp in order for wheelchair users to maneuver and change direction to cross the street in the direction of pedestrian traffic. Crosswalk configurations indicated in Publication 72M, *Roadway Construction Standards*, RC-67M encompass this clear space and provide some degree of safety to the pedestrian while maneuvering across the street. Although the written guidance in this chapter does not indicate that a diagonal curb ramp requires the installation of a crosswalk, as a safety consideration, new crosswalk striping should be added to projects in medium to high pedestrian traffic areas to create the necessary clear space (overrun area) within the crosswalk configuration.

12. Question - Is it acceptable to retain a drainage inlet or manhole in place where a pedestrian with a disability could cross them?

Answer - If necessary, yes. The ADA does not desire to prevent these existing crossings except for new construction where they can be addressed in design. Remember that the ground surface for any accessible route must be stable, firm and slip-resistant. Grates and manhole covers must also be flush with the adjacent surface. Every effort should be made to position the ramp surface direction so that the pedestrian does not have to cross an inlet. The ADAAG makes provision for the appropriate grate type*** that is permissible in an accessible route walking surface. Note: The reduced opening size for ADA accessible grates may greatly reduce the hydraulic efficiency for the street inlet and increase the accumulation of debris at the inlet.

*** If gratings are located in walking surfaces, then they must have spaces no greater than 13 mm (0.5 in) wide in one direction. If gratings have elongated openings, then they must be placed so that the long dimension is perpendicular to the dominant direction of travel. See [Section 6.5.B](#) for additional information.

13. Question - Do we need to install a curb ramp at street locations where the adjacent roadway or gutter slopes exceed the ADAAG standard of 1V:20H (5.00%)?

Answer -Yes. The ADAAG is basically written for new construction where these issues can be addressed and avoided in design. In the original ADAAG, curb ramps were to be installed where an accessible route crossed a roadway; however, this provision has been greatly expanded in later years to where curb ramps are expected at every curbed roadway intersection where sidewalks enter the street. In an existing right-of-way that is not otherwise being altered, the minimum requirement for achieving program accessibility is the installation of curb ramps at selected locations where existing pedestrian walkways cross curbs. Even on steep sites, pedestrians using motorized wheelchairs or being assisted in traveling can use curb ramps and a connection to the street crossing should be available if there is a pedestrian walkway.

U.S. DOJ ADA Title II, Technical Assistance Manual Guidance – II-6.6000 Curb ramps. "When streets, roads, or highways are newly built or altered, they *must* have ramps or sloped areas *wherever there are curbs* or other barriers to entry from a sidewalk or path. Likewise, when new sidewalks or paths are built or altered, they *must* contain curb ramps or sloped areas *wherever they intersect with streets, roads, or highways*."

If it is not possible to install a curb ramp that is fully compliant with ADAAG in an existing sidewalk, each feature of accessibility should be maximized within the constraints of the site conditions at that location. Every decision must be arrived at individually, after considering the effects of contributing factors for the given site conditions based on the following guideline:

Alterations must follow the ADA Standards for Accessible Design unless compliance is technically infeasible. Where the nature of an existing facility makes it virtually impossible to comply with all of the accessibility standards applicable to planned alterations, any altered features of the facility that can be made accessible must be made accessible.

Additionally, because alterations to existing rights-of-way offer fewer opportunities to mitigate the effects of topography and to incorporate maneuvering space and other accessibility features, accessibility guidelines include less stringent technical criteria for some conditions, such as a steeper permitted slope for a curb ramp where it may be technically infeasible to meet new construction requirements. Alterations, however, may not be undertaken that have the effect of reducing existing levels of accessibility below the requirements for new construction.

14. Question - Curb ramp alteration work must transition to the adjacent existing sidewalk width and cross slope at some point. Is there a limit to the length of adjacent sidewalk that should be replaced?

Answer - The curb ramp must be constructed to meet the standards. The transition to the existing sidewalk width and cross slope will be as per Publication 72M, *Roadway Construction Standards*, RC-67M. The transition may not meet the standards but is intended to serve as temporary connection until the substandard sidewalk can be addressed in a subsequent project. See [Section 6.3.D](#) for additional information.

15. Question - A multi-block length of roadway is being resurfaced. The intersection corners have curb ramps that meet some but not all of the current design guidelines. For example, the cross slope may be too steep or the curb ramps do not have detectable warnings. Must the curb ramps be reconstructed to the latest guidelines as part of the resurfacing project?

Answer - Yes, if it is technically feasible to provide the complying facilities. The work should be done at the same time the resurfacing is being done. See [Section 6.2.B](#) for additional information.

16. Question - One corner of an intersection is being altered by curb and gutter reconstruction and paired curb ramps are being installed as part of this project. The other three corners of the intersection are not being altered. Must new upgraded curb ramps be provided at the unaltered corners as part of this work?

Answer - No. The scope of the project requires new upgraded curb ramps *only at the altered corner*. (Note: The ramps of the unaltered corner must be added to the transition plan.) See [Section 6.2.B](#) for additional information.

17. Question - What activities are not considered to be alterations?

Answer - The DOJ does not consider maintenance activities, such as filling potholes, to be alterations. The DOJ does consider resurfacing to be an alteration. Source: DOJ's ADA Title II Technical Assistance Manual, § II-6.6000, 1993.

The FHWA has determined that maintenance activities include actions that are intended to preserve the system, retard future deterioration and maintain the functional condition of the roadway without increasing the structural capacity. These activities include, but are not limited to, thin surface treatments (nonstructural), joint repair, pavement patching (filling potholes), shoulder repair, signing, striping, minor signal upgrades and repairs to drainage systems. See [Section 6.2.B.3](#) for additional information.

18. Question - Does a project altering a public right-of-way require simultaneous accessibility improvements?

Answer - Yes. An alteration project must be planned, designed and constructed so that the accessibility improvements within the scope of the project occur at the same time as the alteration. Source: 29 CFR § 35.151; Kinney v. Yerusalem, 9 F.3d 1067 (3d Cir. 1993), cert. denied, 511 U.S. 1033 (1994).

The ADA does not stipulate how to perform simultaneous accessibility improvements. For example, a public agency may select specialty contractors to perform different specialized tasks prior to completion of the alteration project or concurrently with an ongoing project.

19. Question - Will it be necessary to modify Highway Occupancy Permit drawings if changes to curb ramps impact crosswalks and stop bar locations?

Answer - The need to provide new or additional pedestrian access along and across existing highways as a result of new adjacent property development will require the approval and issuance of a PennDOT Highway Occupancy Permit (HOP) to the local government or adjacent property owner. The HOP elements may include the need for ADA accessibility facilities. PennDOT has the oversight responsibility for ADA accessibility within our roadway right-of-way including all HOP sites. Permit approvals should include the appropriate review of proposed accessibility facilities to meet approved standards and also require appropriate construction inspection to insure all permit accessibility standards have been met.

It is recommended that alterations to an existing HOP that creates substantial revisions to the functional use of the curb ramp, crosswalk configuration, or stop bar locations should be recorded by an acceptable method and become part of the HOP file. See [Section 6.2.B.1.b](#) for additional information.

D. Elements of Accessible Design - New Construction.**1. Question - Is there a specific static coefficient of friction required for a surface to be "slip resistant?"**

Answer - Recommended static coefficients of friction for walking vary. OSHA recommends that walking surfaces have a static coefficient of friction of 0.5. The U.S. Access Board recommends a static coefficient of friction of 0.6 for accessible routes and 0.8 for ramps. However, there are a variety of ways to measure the coefficient of friction for different materials and no single test device or procedure has been identified by the U.S. Access Board. Without a defined test procedure, these friction values cannot be applied. It is recommended to use products that are identified by the manufacturer as having a "slip resistant" surface. See [Section 6.5.A.1](#) for additional information.

2. Question - Will a standard provision be developed to require contractors to remove and replace curb ramps at their own expense if a new curb ramp installation does not meet criteria?

Answer - No. Construction inspection and approval of all construction activities remain the responsibility of the Department and ADA improvements should be given the same degree of importance as any other highway construction item. Each contract accessibility feature should be field inspected, measured and approved to ensure that the proper construction details and specifications have been appropriately met. Accessibility facilities not meeting the approved standards as determined by Department construction personnel will require the contractor to remove and replace the facility until they are in conformance to the construction standards.

For alteration projects, the ADA facilities will be constructed to the maximum extent feasible within the scope of the alteration. Construction contracts will not receive final acceptance until all accessibility facilities are approved by the Department.

E. Temporary Routes for Alteration Project Accessibility.**1. Question - How will alteration construction activities affect existing ADA accessibility?**

Answer - Any construction activity required for alterations that affect existing pedestrian circulation paths will require the provision of a safe, alternate and accessible pedestrian route around the construction activity. The alternate route around the work zone must comply with all applicable accessibility guidelines to the maximum extent feasible so that the usability of the accessible route is maintained. The alternate route will be kept in place through the duration of the construction activity. See [Section 6.14](#) for additional information.

F. Maintenance Issues.**1. Question - Are maintenance operations considered alterations for the purpose of the ADA?**

Answer - The DOJ does not consider normal maintenance activities, such as filling potholes, to be alterations. The DOJ does consider resurfacing beyond normal maintenance to be an alteration. Source: DOJ's ADA Title II Technical Assistance Manual, § II-6.6000, 1993.

The FHWA has determined that maintenance activities include actions that are intended to preserve the system, retard future deterioration and maintain the functional condition of the roadway without increasing the structural capacity. These activities include, but are not limited to, thin surface treatments (nonstructural), joint repair, pavement patching (filling potholes), shoulder repair, signing, striping, minor signal upgrades and repairs to drainage systems. See [Section 6.2.B.3](#) for additional information.

2. Question - Do maintenance activities require simultaneous improvements of the facility to meet ADA standards?

Answer - No. Maintenance activities do not require simultaneous improvements to pedestrian accessibility under the ADA and Section 504. However, in the development of the maintenance scope of work identified accessibility needs should be incorporated into the transition process. See [Section 6.2.B.3](#) for additional information.

3. Question - What obligation does a public agency have regarding snow removal in its walkways?

Answer - A public agency must maintain its walkways in an accessible condition, with only isolated or temporary interruptions in accessibility. Source: 28 CFR §35.133. Part of this maintenance obligation includes reasonable snow removal efforts. See [Section 6.6](#) for additional information.

4. Question - What day-to-day maintenance is a public agency responsible for under the ADA?

Answer - As part of maintenance operations, public agencies' standards and practices must ensure that the day-to-day operations keep the path of travel on pedestrian facilities open and usable for persons with disabilities, throughout the year. This includes snow removal, as noted above, as well as debris removal, maintenance of accessible pedestrian walkways in work zones and correction of other disruptions. Source: ADAAG 4.1.1(4). See [Section 6.6](#) for additional information.

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CHAPTER 6, APPENDIX A

TECHNICALLY INFEASIBLE FORM

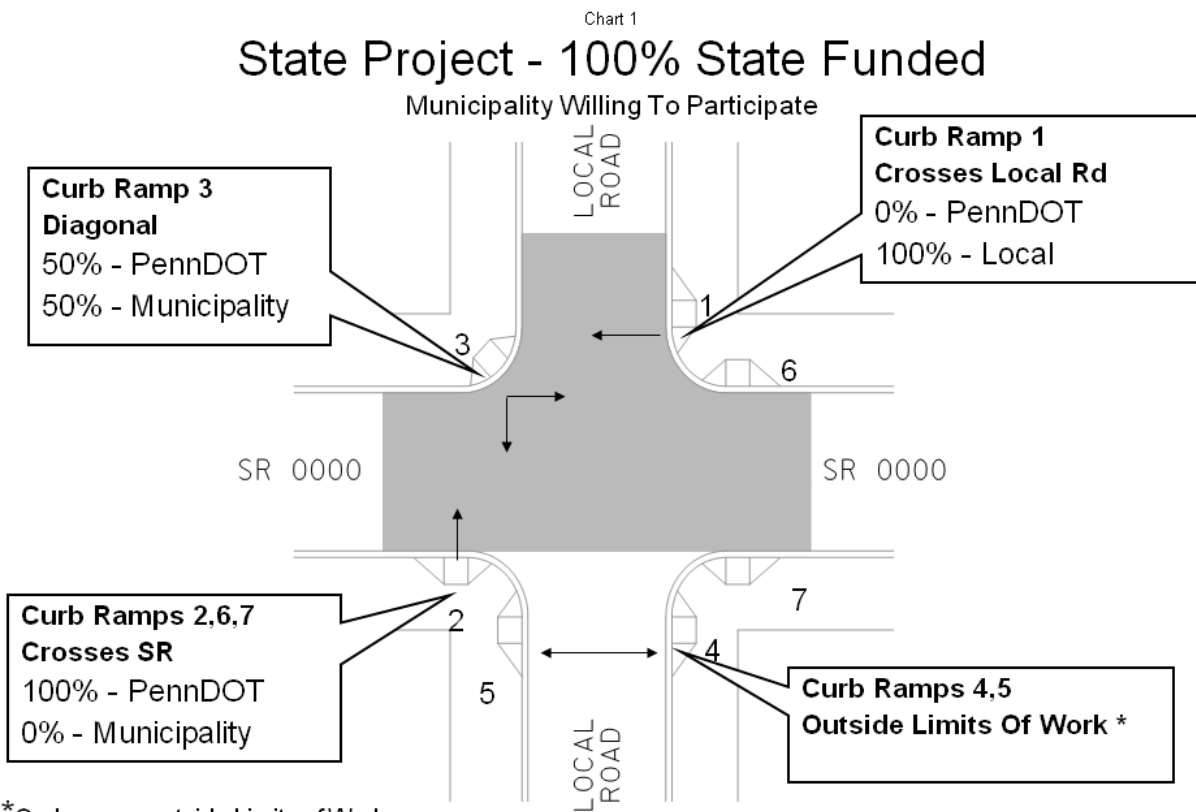
(05-08)



ADA Technically Infeasible Form	
*Facility Type ☐ Curb Ramp ☐ Sidewalk ☐ Ped. Push Button ☐ Ped. Signal ☐ Other _____	Forward All Completed Forms to PennDOT Construction
Justification for Technically Infeasible <i>(check all that apply)</i> ☐ Limited Right-of-Way ☐ Existing Utilities ☐ Structures, Buildings, Vaults ☐ Historic Areas ☐ Environmental Areas ☐ Grade Separations ☐ Other 1 _____ ☐ Other 2 _____ ☐ Other 3 _____ ☐ Other 4 _____	General Information *District: _____ *County: _____ *Twshp/Boro: _____ Project ECMS # _____ Submitter Information Submitted By: _____ *Submitter Company: _____ Street Address _____ City State Zip _____ Telephone _____ *Date Submitted: _____
Project Information Project Type ☐ Resurfacing Project ☐ Signal Project ☐ Widening Project ☐ Reconstruction ☐ New Construction (Tech Infeasible normally N/A) ☐ Other _____ Pedestrian Traffic ☐ Yes ☐ No Pedestrian Trip Generators ☐ Yes ☐ No Safety Concerns ☐ Yes ☐ No R9-3A "No Peds" Signs ☐ Yes ☐ No Existing Crosswalk ☐ Yes ☐ No Existing Sidewalk ☐ Yes ☐ No Existing Push Buttons ☐ Yes ☐ No ADT _____	Location Identification *SR North - Segment _____ *SR South - Segment _____ *SR East - Segment _____ *SR West - Segment _____ Use Graphic to ID _____ Location # _____
Investigated design alternatives 1.) _____ 2.) _____ 3.) _____	Why alternative was not selected _____ _____ _____
Alternative selected and description of what requirement is not met 	
ADA Review Committee Recommendation ☐ Approved ☐ Denied _____ ADA Review Committee Chair - Date _____	ADE of Design Approval Status ☐ Approved ☐ Denied _____ District ADE of Design - Date _____
TIF #: _____ <i>(TIF Number automatically assigned. All fields marked with * provide data for TIF #)</i>	

CHAPTER 6, APPENDIX B

FUNDING SCENARIOS

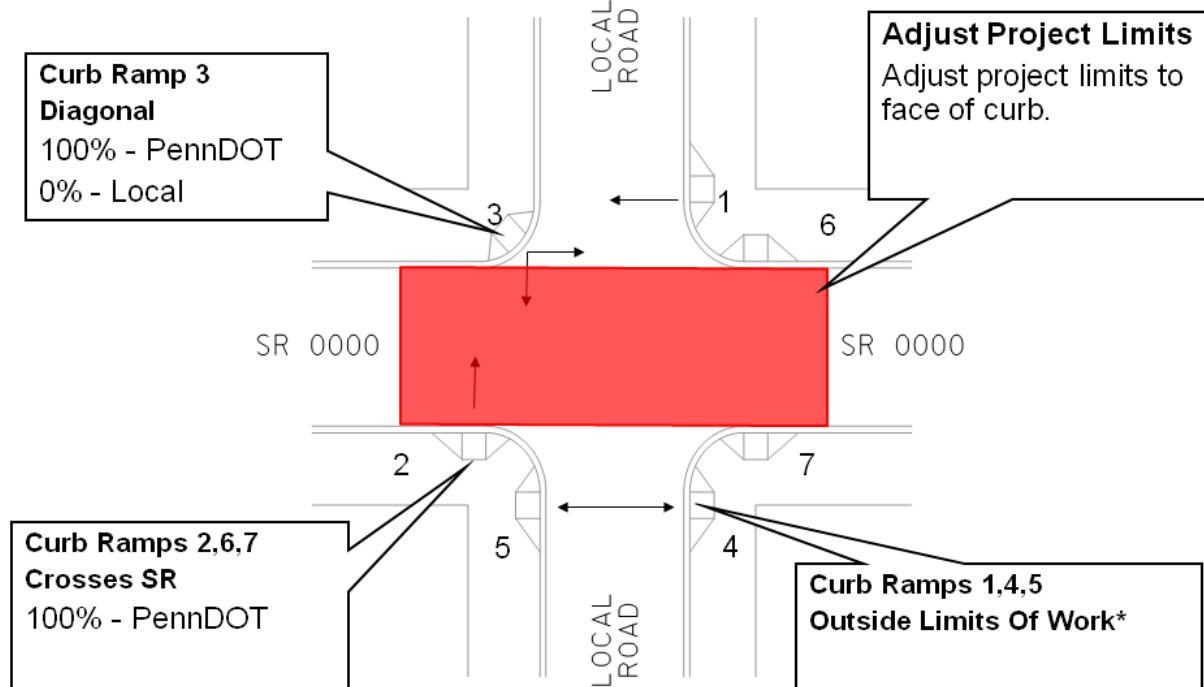


*Curb ramps outside Limits of Work:

- Are encouraged to be upgraded.
- Must be upgraded if impacted by the upgrade of other curb ramps.

Chart 2

State Project – 100% State Funded

Municipality **NOT** willing to participate

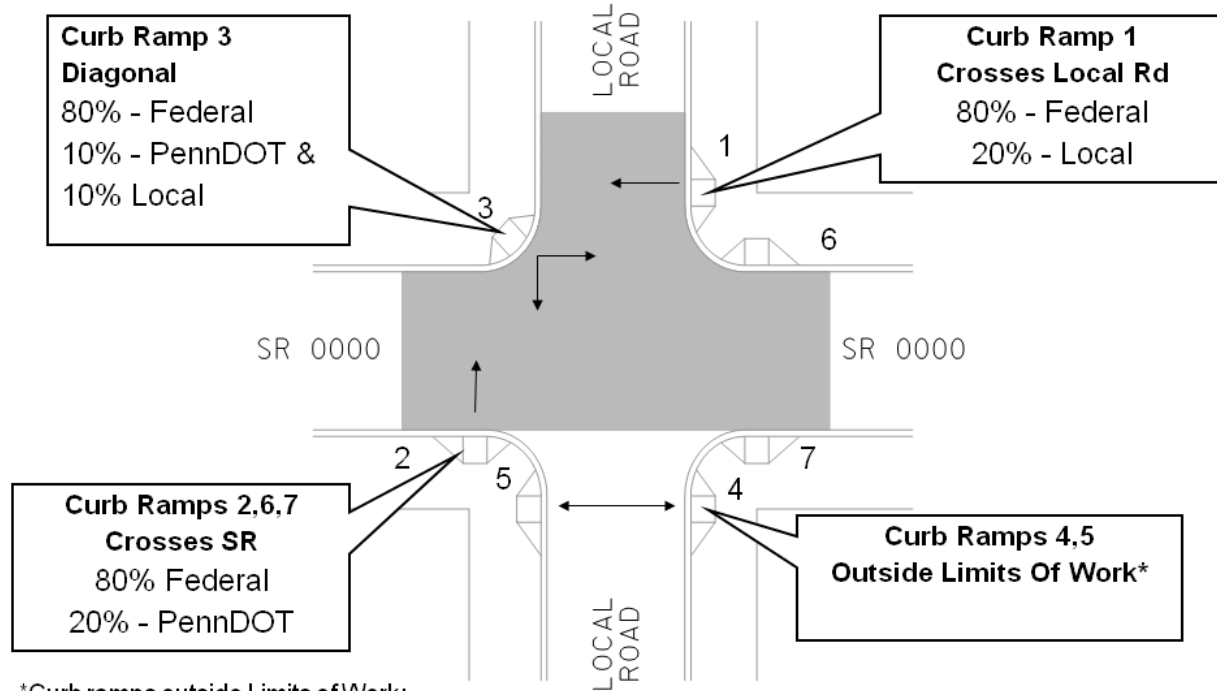
*Curb ramps outside Limits of Work:

- Are encouraged to be upgraded.
- Must be upgraded if impacted by the upgrade of other curb ramps.

Chart 3

State Project - Federal and State Funded

Municipality willing to participate

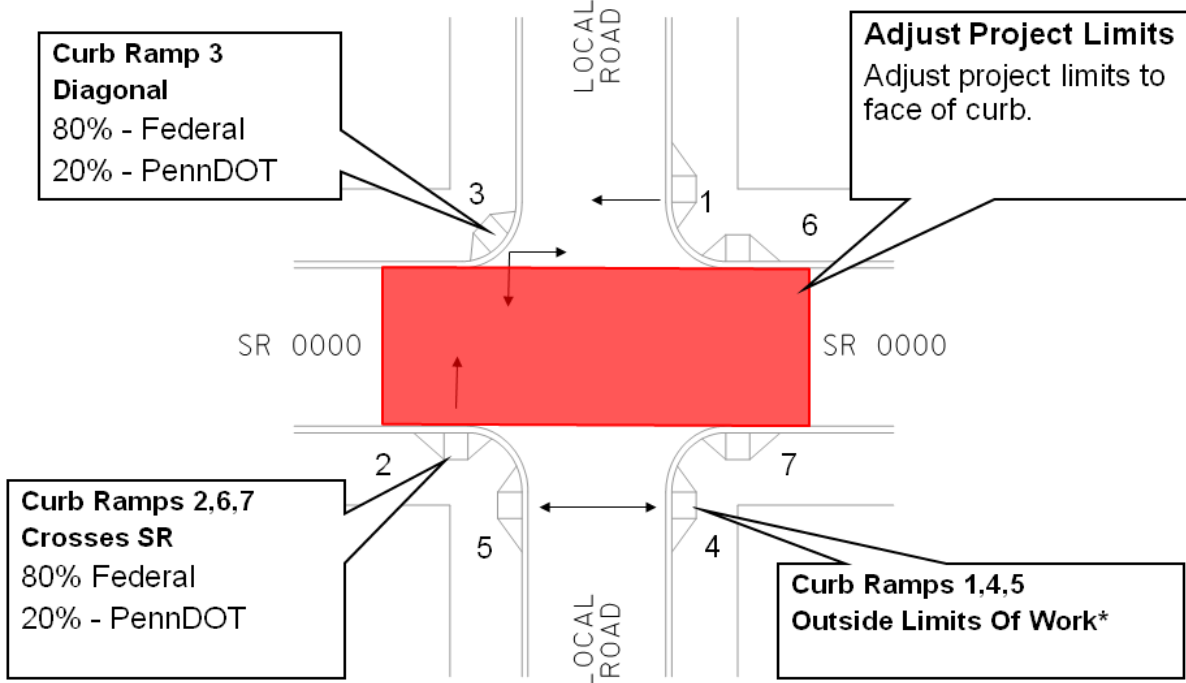


*Curb ramps outside Limits of Work:

- Are encouraged to be upgraded.
- Must be upgraded if impacted by the upgrade of other curb ramps.

Chart 4

State Project - Federal and State Funded

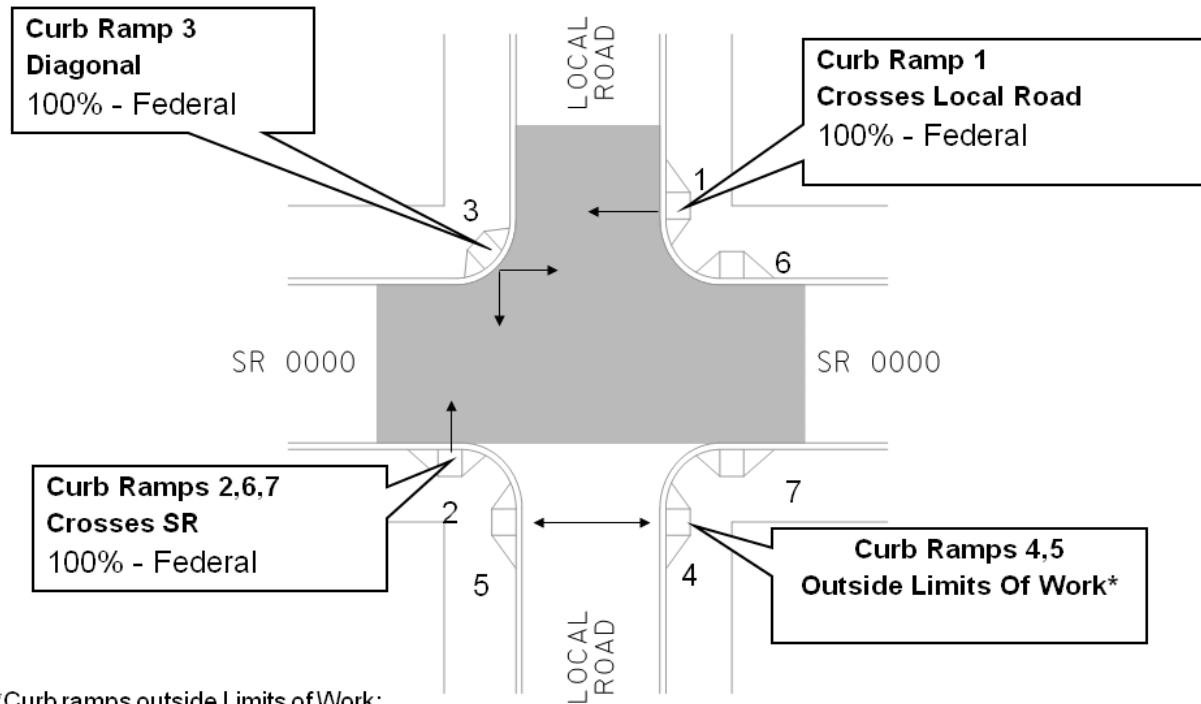
Municipality **NOT** willing to participate

*Curb ramps outside Limits of Work:

- Are encouraged to be upgraded.
- Must be upgraded if impacted by the upgrade of other curb ramps.

Chart 5

State Project – 100% Federally Funded

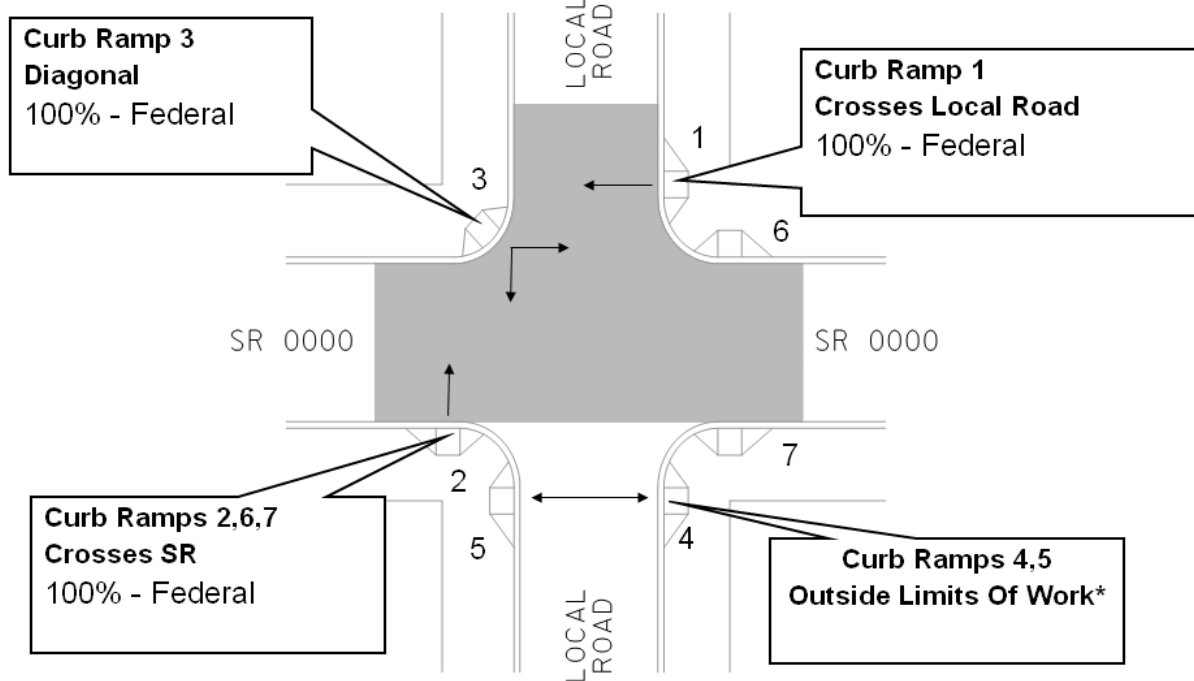


*Curb ramps outside Limits of Work:

- Are encouraged to be upgraded.
- Must be upgraded if impacted by the upgrade of other curb ramps.

Chart 6

Local Project – 100% Federally Funded



*Curb ramps outside Limits of Work:

- Are encouraged to be upgraded.
- Must be upgraded if impacted by the upgrade of other curb ramps.

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CHAPTER 6, APPENDIX C

REIMBURSEMENT AND MAINTENANCE AGREEMENT

Table 6.C.1
Summary of Letters and Agreements

Attachment "A"	Notice of Future PennDOT Construction Project with Americans with Disabilities Act Accessibility Issues (standard letter).
Attachment "B"	Construction and Maintenance of Americans with Disabilities Act Compliant Pedestrian Facilities (standard letter).
Attachment "C"	Maintenance of Pedestrian Facilities to Meet Americans with Disabilities Act Requirements (standard letter).
Attachment "D"	Reimbursement and Maintenance Agreement (legal agreement).
Attachment "E"	Sidewalk Maintenance Agreement (legal agreement).
Attachment "F"	PennDOT/Municipality Funding Scenario Flowchart.

– ATTACHMENT "A" –

(Date)

Municipality Contact Person
Municipality Name
Street Address
City, State Zip Code

Subject: Notice of Future PennDOT Construction Project with Americans with Disabilities Act Accessibility Issues

County:
Municipality Name
SR , Section
Project Length:
Project Name:
MPMS Number:

Dear Municipality Contact Person:

The Pennsylvania Department of Transportation is planning a roadway alteration project within your city/township/borough which will affect the use of the public right-of-way.

The Americans with Disabilities Act (ADA) of 1990 is a civil rights statute that prohibits discrimination against people with disabilities. ADA implementing regulations for Title II prohibit discrimination in the provision of services, programs, and activities by state and local governments. Designing and constructing pedestrian facilities in the public right-of-way that are not usable by people with disabilities may constitute discrimination. Section 504 of the Rehabilitation Act of 1973 (504) includes similar prohibitions in the conduct of federally-funded programs.

To meet the requirements of the ADA, all projects affecting the use of pedestrian accessible routes in the public right-of-way must incorporate pedestrian access improvements within the scope of the project. Specifically, all pedestrian facilities within the scope of the project must be improved to meet the current ADA standards and any locations missing a required pedestrian facility must have a pedestrian facility installed during construction of the project.

We desire to meet with you within the next two weeks to discuss ADA accessibility issues, appropriate cost sharing, utility or right-of-way concerns, and future maintenance responsibilities for this project. The individual listed below will contact you within two weeks to set-up a meeting date.

– ATTACHMENT "A" –

Please direct all correspondence to the following contact:

PennDOT Engineering District 0-0

Contact Person

Street Address

City, State Zip Code

Telephone: (000) 000-0000

E-mail: xxxxx@pa.gov

Sincerely,

Project Manager's Name

Title

– ATTACHMENT "B" –

(Date)

Municipality Contact Person
Municipality Name
Street Address
City, State Zip Code

VIA CERTIFIED MAIL

**RE: Construction and Maintenance of Americans with Disabilities Act Compliant
Pedestrian Facilities**

Dear Municipality Contact Person:

As discussed in our meeting on (Date), the Pennsylvania Department of Transportation (Department) plans to improve SR _____ through roadway alterations or resurfacing at the intersection of (Street Name), which is under the jurisdiction of (Municipality Name). To meet current accessibility standards required by the Americans with Disabilities Act (ADA), altered pedestrian facilities must meet the latest standards.

Scenario #1 – PennDOT and Municipal Share Construction Efforts

☐ It was determined at the meeting referenced above that (Municipality Name) will construct or improve pedestrian facilities that service local streets on its own accord rather than have the Department include the pedestrian facilities as part of its project. The Department will construct the remaining pedestrian facilities as part of its project.

The Department acknowledges that (Municipality Name) will construct or improve pedestrian facilities at the intersection of SR _____ and (Street Name) which meet the standards for pedestrian accessibility required by the Americans with Disabilities Act Accessibility Guidelines (ADAAG), 28 CFR Part 36, as amended, and that the construction will be completed by or immediately after completion (within _____ months) of the Department's project.

The Department acknowledges its intent to construct or improve pedestrian facilities at the intersection of SR _____ and (Street Name) which meet the standards for pedestrian accessibility required by the Americans with Disabilities Act Accessibility Guidelines (ADAAG), 28 CFR Part 36, as amended, and that the construction will be completed as part of the Department's project.

Scenario #2 – PennDOT Performs All Construction

☐ It was determined at the meeting referenced above that the Department will construct or improve all pedestrian facilities as part of its project.

The Department acknowledges its intent to construct or improve pedestrian facilities at the intersection of SR _____ and (Street Name) which meet the standards for pedestrian accessibility required by the Americans with Disabilities Act Accessibility Guidelines (ADAAG), 28 CFR Part 36, as amended, and that the construction will be completed as part of

– ATTACHMENT "B" –

the Department's project.

Scenario #3 – Municipality Performs All Construction

☐ It was determined at the meeting referenced above that (Municipality Name) will construct or improve all pedestrian facilities as part of its project.

(Municipality Name) acknowledges its intent to construct or improve pedestrian facilities at the intersection of SR ____ and (Street Name) which meet the standards for pedestrian accessibility required by the Americans with Disabilities Act Accessibility Guidelines (ADAAG), 28 CFR Part 36, as amended, and that the construction will be completed by or immediately after completion (within ____ months) of the Department's project.

Financial Responsibilities

The constructed or improved pedestrian facilities that service the local streets will be constructed at (Municipality Name's) expense. The constructed or improved pedestrian facilities that service state routes will be constructed at the Department's expense. The constructed or improved pedestrian facilities that service both local and state routes will be constructed at a shared 50/50 cost and expense.

Maintenance Responsibilities

According to the State Highway Law of 1945, as amended, (Municipality Name) is responsible for maintaining structures located outside of the highway curb lines. Therefore, (Municipality Name) will be responsible for the year-round maintenance and repair of the new pedestrian facilities. The Department in no way assumes or acknowledges any jurisdiction over the pedestrian facilities or the responsibility for the maintenance and future repair of the pedestrian facilities upon their completion.

Thank you for your attention to this matter. If you have any questions, please contact (Contact Person) at (000) 000-0000.

Sincerely,

Project Manager's Name
Title

– ATTACHMENT "C" –

(Date)

Municipality Contact Person
Municipality Name
Street Address
City, State Zip Code

VIA CERTIFIED MAIL

RE: Maintenance of Pedestrian Facilities to Meet Americans with Disabilities Act Requirements

Dear Municipality Contact Person:

As indicated in the letter dated (Date), the Pennsylvania Department of Transportation (Department) plans to improve SR _____ through roadway alterations or resurfacing at the intersection of (Street Name), which is under the jurisdiction of (Municipality Name). To meet current accessibility standards required by the Americans with Disabilities Act (ADA), altered pedestrian facilities must meet the latest standards at the intersection. It has been determined that (Municipality Name) is not willing to sign an agreement with the Department to set forth cost reimbursement and maintenance obligations for the pedestrian facilities.

In the absence of an agreement, the Department will proceed with the construction of the pedestrian facilities as part of its roadway reconstruction project. PennDOT will only address curb ramps along local streets for which the pedestrian path is negatively impacted by the construction of curb ramps along state routes.

According to the State Highway Law of 1945, as amended, (Municipality Name) is responsible for maintaining structures located outside of the highway curb lines. Therefore, upon completion of construction, (Municipality Name) will be responsible for the year-round maintenance and repair of the pedestrian facilities. By constructing the pedestrian facilities to provide ADA compliance, the Department in no way assumes or acknowledges any jurisdiction over the pedestrian facilities or the responsibility for the maintenance and future repair.

Thank you for your attention to this matter. If you have any questions, please contact (Contact Person) at (000) 000-0000.

Sincerely,

Project Manager's Name
Title

– ATTACHMENT "D" –

Municipality: _____
 Federal ID #: _____
 SAP Vendor #: _____

Agreement #: _____
 Project (SR & Sec): _____
 MPMS #: _____

REIMBURSEMENT & MAINTENANCE AGREEMENT

THIS AGREEMENT, made and entered into this _____ day of _____, 20____, by and between the Commonwealth of Pennsylvania, acting through the Pennsylvania Department of Transportation (PENNDOT), hereinafter called the COMMONWEALTH,

a n d

_____, a political subdivision duly and properly formed under the laws of the Commonwealth of Pennsylvania, acting through its proper officials, hereinafter called the MUNICIPALITY.

W I T N E S S E T H:

WHEREAS, the COMMONWEALTH has under its jurisdiction SR _____, located in _____, _____ County; and,

WHEREAS, the COMMONWEALTH plans to improve SR _____, from Segment _____ Offset _____ to Segment _____ Offset _____, through roadway alterations or resurfacing, hereinafter referred to as the PROJECT, as more fully described on Exhibit "A," which is attached hereto and made part of this Agreement; and,

WHEREAS, SR _____ intersects with (a) street(s) under the jurisdiction of the MUNICIPALITY; and,

WHEREAS, all pedestrian facilities altered by a roadway alteration or construction project must be updated to current accessibility standards required by the Americans with Disabilities Act (ADA); and,

WHEREAS, to meet the ADA requirements, the COMMONWEALTH will remove the existing pedestrian facility(ies) at the intersection(s) of State Route _____ and _____, and install new pedestrian facilities as part of the PROJECT, hereinafter referred to as the PEDESTRIAN FACILITIES; and,

WHEREAS, the PEDESTRIAN FACILITIES will be installed to serve pedestrian traffic and must meet the design guideline standards for pedestrian accessibility required by the Americans with Disabilities Act Accessibility Guidelines (ADAAG), 28 CFR Part 36, as amended; and,

WHEREAS, the COMMONWEALTH is willing to construct the PEDESTRIAN FACILITIES as part of the PROJECT, subject to reimbursement by the MUNICIPALITY as set forth in Paragraph 3 below; and,

WHEREAS, the MUNICIPALITY is willing to reimburse the COMMONWEALTH for construction and inspection costs associated with the PEDESTRIAN FACILITIES, as detailed in this Agreement; and,

WHEREAS, upon completion of construction of the PEDESTRIAN FACILITIES, the MUNICIPALITY must assume year-round responsibility for maintenance of said PEDESTRIAN FACILITIES; and,

WHEREAS, the parties desire to enter into this Agreement to set forth the financial obligations and maintenance responsibilities for the PROJECT and the PEDESTRIAN FACILITIES.

NOW THEREFORE, for and in consideration of the foregoing premises and the mutual promises set forth below, the parties agree, with the intention of being legally bound, to the following:

1. The recitals set forth above are incorporated by reference as a material part of this Agreement.
2. The COMMONWEALTH, by contract or with its own forces, will construct the PROJECT and the PEDESTRIAN FACILITIES in accordance with the plans, specifications, and drawings prepared by or for the COMMONWEALTH, which are incorporated herein by reference as if physically attached hereto.
3. The COMMONWEALTH shall be responsible for all costs of the PROJECT other than the PEDESTRIAN FACILITIES. The MUNICIPALITY shall be responsible for the costs of the PEDESTRIAN FACILITIES as follows:
 - A. The MUNICIPALITY shall be solely responsible for the costs of PEDESTRIAN FACILITIES constructed to provide access across a local street under the jurisdiction of the MUNICIPALITY at the intersection of a state highway.
 - B. The MUNICIPALITY and the COMMONWEALTH shall be equally responsible for the costs of PEDESTRIAN FACILITIES constructed on the diagonal of an intersection which provide access across both a local street under the jurisdiction of the MUNICIPALITY and a state highway.
 - C. The COMMONWEALTH shall be solely responsible for the costs of PEDESTRIAN FACILITIES constructed at the intersection of two state highways.

4. The MUNICIPALITY shall pay to the COMMONWEALTH, by way of reimbursement, for all actual costs associated with construction of the PEDESTRIAN FACILITIES, including inspection costs, as tabulated on Exhibit "C," which is attached to and made part of this Agreement, estimated to be _____ (\$XX,XXX.XX); and,
5. Upon completion of the PEDESTRIAN FACILITIES, the COMMONWEALTH shall send the MUNICIPALITY a written notice of completion and an invoice specifying the items constituting the total cost of the PEDESTRIAN FACILITIES for which it is responsible in accordance with Paragraph 3 above. The MUNICIPALITY shall make payment to the COMMONWEALTH in full through the Option circled below:

Option A:

The MUNICIPALITY shall make payment to the COMMONWEALTH in full within thirty (30) days of receipt of such invoice.

Option B:

The MUNICIPALITY shall, after receipt of such invoice, make monthly payments to the COMMONWEALTH for a period of one (1) year. The payments will be in equal amounts and total all costs due hereunder.

Option C:

The MUNICIPALITY shall make payment to the COMMONWEALTH in full after receiving the necessary funds from a Pennsylvania Infrastructure Bank (PIB) loan. The MUNICIPALITY shall make payment to the COMMONWEALTH in full within thirty (30) days of receipt of such loan, which must be no longer than sixty (60) days after completion of the Project.

Option D:

The MUNICIPALITY authorizes the COMMONWEALTH to withhold and apply so much of the MUNICIPALITY's Liquid Fuels Tax Fund allocation as necessary to reimburse the COMMONWEALTH in full for all costs due hereunder.

6. Upon receipt of the notice required by Paragraph 5 above, the MUNICIPALITY shall, at its sole cost and expense, be responsible for the year-round maintenance and repair of the PEDESTRIAN FACILITIES, which include, without limitation, clearing and removal of snow and ice and application of anti-skid or de-icing materials. The MUNICIPALITY may by ordinance transfer these responsibilities (both maintenance and future alteration required by ADAAG) to other parties but the MUNICIPALITY shall remain responsible for the enforcement of such ordinance. Additionally, the MUNICIPALITY shall, at its sole cost and expense, be responsible for all future alterations to the PEDESTRIAN FACILITIES required by the ADAAG. Nothing contained in this Agreement must be construed as an assumption or acknowledgement by the COMMONWEALTH of responsibility for the maintenance and future repair of the PEDESTRIAN FACILITIES.
7. The MUNICIPALITY, by executing this Agreement, certifies that it has on hand or will acquire sufficient funds to meet all of its obligations for the PEDESTRIAN FACILITIES as set forth in Paragraph 4.
8. If the MUNICIPALITY fails to perform any of the terms, conditions or provisions of this Agreement, including, but not limited to, any default of payment for a period of forty-five (45) days, the MUNICIPALITY authorizes the COMMONWEALTH to withhold so much of the MUNICIPALITY's Liquid Fuels Tax Fund allocation as may be necessary to reimburse the COMMONWEALTH in full for all costs due hereunder; and the MUNICIPALITY does hereby and herewith authorize the COMMONWEALTH to withhold such amount and to apply such funds or portion thereof, to remedy such default.
9. The MUNICIPALITY must indemnify, save harmless, and defend (if requested) the COMMONWEALTH, its officers, agents, and employees from all suits, actions, or

claims of any character, name, or description brought for on account of any injuries to or damages received or sustained by any person, persons or property by or from the MUNICIPALITY, its contractors, their officers, agents and employees as a result of the obligations assumed by the MUNICIPALITY under this Agreement.

10. Nothing contained in this Agreement shall be deemed to be a waiver by the COMMONWEALTH of its discretion to abandon or postpone the PROJECT.
11. The MUNICIPALITY agrees to comply with the *Contractor Integrity Provisions*, the *Commonwealth Nondiscrimination/Sexual Harassment Clause*, the *Provisions Concerning the Americans with Disabilities Act*, and the *Right-to-Know Law Provisions* which are attached hereto and made part hereof as Exhibits "D," "E," "F," and "G," respectively.
12. The MUNICIPALITY shall enact and/or adopt such ordinances and/or resolutions as may be necessary to effect the purposes of this Agreement.
13. The actions that the COMMONWEALTH is either required or authorized to perform pursuant this Agreement are not intended to enlarge, and must not be construed as enlarging, its obligations regarding maintenance and operation of the state highway system under either the State Highway Law, Act of June 1, 1945, P.L. 1242, as amended, 36 P.S. § 670-101 et seq., or the Act of September 18, 1961, P.L. 1389, No. 615, as amended, 36 P.S. § 1758-101 et seq.
14. This Agreement will not be effective until all necessary COMMONWEALTH officials as required by law have executed it. Following full execution, the COMMONWEALTH will insert the effective date at the top of Page 1.

IN WITNESS WHEREOF, the parties have executed this Agreement the date first above written.

ATTEST

MUNICIPALITY

Title: DATE

BY _____
Title: DATE

If a Corporation, the President or Vice-president must sign and the Secretary, Treasurer, Assistant Secretary or Assistant Treasurer must attest; if a sole proprietorship, only the owner must sign; if a partnership, only one partner need sign; if a limited partnership, only the general partner must sign. If a Municipality, Authority or other entity, please attach a resolution.

DO NOT WRITE BELOW THIS LINE--FOR COMMONWEALTH USE ONLY

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

BY _____
Deputy Secretary for DATE
Highway Administration

APPROVED AS TO LEGALITY
AND FORM

BY _____
for Chief Counsel Date

FUNDS COMMITMENT DOC. NO. _____
CERTIFIED FUNDS AVAILABLE UNDER
SAP NO. _____
SAP COST CENTER _____
GL ACCOUNT _____
AMOUNT _____

BY _____
Deputy General Counsel Date

BY _____
for Comptroller Date

BY _____
Deputy Attorney General Date

– ATTACHMENT "E" –

County(ies): _____ Agreement #: _____
 Project Short Title: _____ MPMS #: _____
 Project (SR &Sec): _____ Federal Aid ID#: _____

SIDEWALK MAINTENANCE AGREEMENT

THIS AGREEMENT, made and entered into this the _____ day of _____, 20____, between the Commonwealth of Pennsylvania, acting through the Department of Transportation, herein called PENNDOT,
 _____ and
 _____, a political subdivision duly and properly formed under the laws of the Commonwealth of Pennsylvania, acting through its proper officials, hereinafter called the MUNICIPALITY.

WITNESSETH:

WHEREAS, the need for sidewalk at the following location(s) has been determined appropriate:

<u>County</u>	<u>State Road</u>	<u>Beginning Segment/Offset</u>	<u>Ending Segment/Offset</u>
---------------	-------------------	---------------------------------	------------------------------

WHEREAS, the cost of constructing sidewalk at these locations is being partially or totally funded with state and/or federal funds; and,

WHEREAS, sidewalk is being installed to serve pedestrian traffic; and,

WHEREAS, the MUNICIPALITY has agreed, upon completion of the sidewalk construction, to assume year-round responsibility for maintenance of said sidewalk.

NOW, THEREFORE, in consideration of the premises, the mutual covenants hereinafter contained and with the intent to be legally bound hereby, the parties hereto agree as follows:

1. PENNDOT will, with its own forces or by contract, construct various improvements along state route _____ (_____) and install sidewalk in accordance with the plans prepared by PENNDOT, which are incorporated herein by reference as though physically attached.
2. Upon completion of said Project by PENNDOT or its contractor(s), PENNDOT will send to the MUNICIPALITY a written notice of completion.
3. Upon receipt of the notice, required by Paragraph 2 above, the MUNICIPALITY shall, at its sole cost and expense, be responsible for the year-round maintenance and repair of the sidewalk, which includes, without limitation, clearing and removal of snow and ice and application of anti-skid or de-icing materials. The MUNICIPALITY may by ordinance transfer these maintenance responsibilities to other parties but the MUNICIPALITY shall remain responsible for the enforcement of such ordinance.
4. PENNDOT shall have the right, at any given time, to terminate this Agreement by giving the MUNICIPALITY thirty (30) days' written notice. In the event of such termination, the MUNICIPALITY's responsibilities under this Agreement, except those of liability, whether financial, in tort or otherwise, shall terminate.
5. The MUNICIPALITY shall indemnify, save harmless, and defend (if requested) PENNDOT, its officers, agents, and employees from all suits, actions, or claims of any character, name, or description brought for on account of any injuries to or damages received or sustained by any person, persons or property by or from the MUNICIPALITY, its contractors, their officers, agents and employees as a result of the obligations assumed by the MUNICIPALITY under this Agreement.
6. If the MUNICIPALITY shall fail to perform any of the terms, conditions, and provisions of this Agreement, the MUNICIPALITY authorizes PENNDOT to withhold so much of the MUNICIPALITY's Liquid Fuels Tax Fund Allocation as may be needed to complete any necessary work and to reimburse PENNDOT in full for all costs due thereof, and does hereby and herewith authorize PENNDOT to withhold such amount and to apply such funds, or portion thereof, to remedy the default.
7. In the event that PENNDOT determines that certain repair, maintenance, or other required action is necessary with respect to the sidewalk, PENNDOT shall notify the MUNICIPALITY in writing. The MUNICIPALITY shall begin necessary work within five (5) days of receipt of PENNDOT's notice. In the event that the MUNICIPALITY fails to commence necessary work within said five- (5-) day period

or fails to prosecute said work diligently to completion, PENNDOT may perform said repair, maintenance, or other necessary action at the MUNICIPALITY's sole cost and expense. Failure by the MUNICIPALITY to pay PENNDOT within forty-five (45) days of receipt of an invoice for work performed by PENNDOT shall constitute a default for purposes of Paragraph 6 of this Agreement.

8. RESOLUTIONS AND ORDINANCES

The MUNICIPALITY shall enact and/or adopt such ordinances and/or resolutions as may be necessary to effect the purposes of this Agreement.

9. NONDISCRIMINATION/SEXUAL HARRASSMENT CLAUSE

The MUNICIPALITY shall comply with the current version of the Commonwealth of Pennsylvania's Nondiscrimination/Sexual Harassment Clause, which is incorporated into this Agreement by reference as though physically attached.

10. CONTRACTOR INTEGRITY PROVISIONS

The MUNICIPALITY shall comply with the current version of the Commonwealth of Pennsylvania's Contractor Integrity Provisions, which are incorporated into this Agreement by reference as though physically attached.

11. AMERICANS WITH DISABILITIES ACT PROVISIONS

The MUNICIPALITY shall comply with the current version of the Commonwealth of Pennsylvania's Provisions Concerning the Americans with Disabilities Act, which are incorporated into this Agreement by reference as though physically attached.

12. RIGHT-TO-KNOW LAW

The Pennsylvania Right-to-Know Law, 65 P.S. §§ 67.101—3104, applies to this Agreement. Therefore, this Agreement is subject to, and the MUNICIPALITY shall comply with, the clause entitled Contract Provisions – Right to Know Law 8-K-1532, attached as Exhibit "A" and made a part of this Agreement. As used in this exhibit, the term "Contractor" refers to the MUNICIPALITY.

13. NOTICE

Notice under this Agreement shall be (a) by personal delivery; (b) by First Class Certified United States Mail, Return Receipt Requested, postage prepaid, or (c) by overnight delivery service having positive tracking, such as Federal Express or United Parcel Service. Notice shall be deemed given when received. The parties shall deliver notice to each other at the following addresses:

To DEPARTMENT:

To MUNICIPALITY:

or to such other address as either party may designate to the other in writing from time to time.

– ATTACHMENT "E" –

IN WITNESS WHEREOF, the parties have executed this Agreement the date first above written.

ATTEST

MUNICIPALITY

Title: DATEBY _____
Title: DATE

If a Corporation, the President or Vice-president must sign and the Secretary, Treasurer, Assistant Secretary or Assistant Treasurer must attest; if a sole proprietorship, only the owner must sign; if a partnership, only one partner need sign; if a limited partnership, only the general partner must sign. If a Municipality, Authority or other entity, please attach a resolution.

DO NOT WRITE BELOW THIS LINE--FOR COMMONWEALTH USE ONLY

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

BY _____
Deputy Secretary or Designee DATE

APPROVED AS TO LEGALITY
AND FORM

BY _____
for Chief Counsel Date

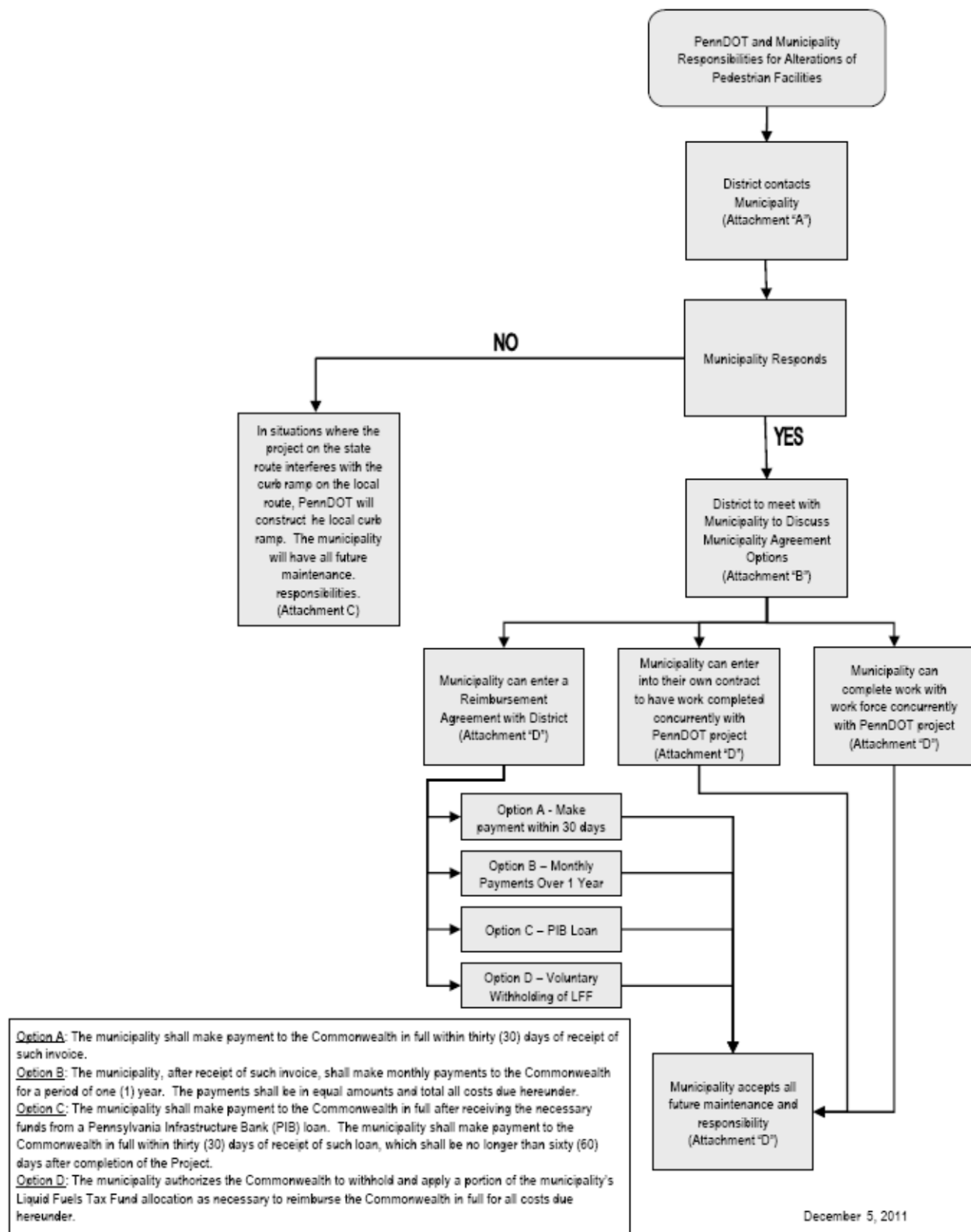
FUNDS COMMITMENT DOC. NO. _____
CERTIFIED FUNDS AVAILABLE UNDER
SAP NO. _____
SAP COST CENTER _____
GL ACCOUNT _____
AMOUNT _____

BY _____
Deputy General Counsel Date

BY _____
for Comptroller Operations Date

BY _____
Deputy Attorney General Date

PennDOT/Municipality Funding Scenario



December 5, 2011

CHAPTER 6, APPENDIX D

RIGHT-OF-WAY LETTERS

Property Owner
Property Address
Authorization to Enter Introduction

Dear Property Owner:

In the coming months, the Pennsylvania Department of Transportation (PennDOT) plans to improve S.R. through roadway and sidewalk alterations or resurfacing at the intersection of Street. PennDOT will be requesting an Authorization to Enter your property in order to repair and/or replace the current Pedestrian Facility in order to comply with the current standards set forth by the Americans with Disabilities Act (ADA).

The Americans with Disabilities Act (ADA) of 1990 is a Federal civil rights statute that prohibits discrimination against people with disabilities. ADA regulations prohibit discrimination in the provision of services, programs, and activities by state and local governments. Designing and constructing pedestrian facilities in the public right-of-way that are not usable by people with disabilities may constitute discrimination. Section 504 of the Rehabilitation Act of 1973 (504) includes similar prohibitions in the conduct of federally-funded programs.

In the coming weeks, a representative of PennDOT will be visiting homes in your municipality to further explain the Authorization to Enter form. PennDOT will not repair and/or replace the current Pedestrian Facility on your property or acquire property from you for that purpose if the Authorization to Enter is not executed.

Should you require any additional information, please contact at .

Sincerely,

District Executive
Engineering District -0

Property Owner
Property Address
Authorization to Enter Denied or Failure to Respond

Dear Property Owner:

This letter is a follow-up to your decision not to grant Authorization to Enter to the Pennsylvania Department of Transportation (PennDOT). This is in reference to repairing or replacing the publicly used Pedestrian Access Facility (sidewalks and curb ramps) that pertain to project _____ and are located within your property located at _____.

PennDOT will not be repairing and/or replacing the current Pedestrian Facility on your property. Be advised that if there are any claims or proceedings in relation to the publicly used Pedestrian Access Facility located within your property, you could potentially be sued or added to a lawsuit.

Should you require any additional information, please contact _____ at _____.

Sincerely,

District Executive
Engineering District _____ -0

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CHAPTER 6, APPENDIX E

PEDESTRIAN STUDY DETERMINATION

Pedestrian Study Determination**General Information**

Date: _____
 District: _____
 Submitted By: _____

Location Information

County: _____
 Municipality: _____
 SR and Section: _____
 Segment/Offset: _____
 Street Name: _____
 Township Road: _____

Project Description:

Provide a brief project description and scope :

--

The need for pedestrian accommodations has been identified through the following procedures.

1. Factors identified from the Bike/Ped. Checklist	Yes <input style="width: 40px;" type="checkbox"/>	No <input style="width: 40px;" type="checkbox"/>
2. Local Comprehensive Planning	Yes <input style="width: 40px;" type="checkbox"/>	No <input style="width: 40px;" type="checkbox"/>
3. Included in project scope at programming	Yes <input style="width: 40px;" type="checkbox"/>	No <input style="width: 40px;" type="checkbox"/>
4. Critical safety need (Safety Review Committee concurrence)	Yes <input style="width: 40px;" type="checkbox"/>	No <input style="width: 40px;" type="checkbox"/>
Description: _____		
5. Municipal request	Yes <input style="width: 40px;" type="checkbox"/>	No <input style="width: 40px;" type="checkbox"/>
6. Field Observation	Yes <input style="width: 40px;" type="checkbox"/>	No <input style="width: 40px;" type="checkbox"/>
(i.e., connect pedestrian generators; observed pedestrian movements)		
Description: _____		
7. Are pedestrian accommodations needed?	Yes <input style="width: 40px;" type="checkbox"/>	No <input style="width: 40px;" type="checkbox"/>

If "Yes" then list the facilities that need upgraded and construct them according to DM-2 Ch. 6 and RC-67M. (Use Executive Summary)

If "No", explain in Executive Summary.

Note: If a pedestrian need has been determined and the construction of pedestrian facilities do not fall within the project scope or the alteration, then ADA features must be included on a Transition Plan and this project should not preclude or impede the inclusion of pedestrian facilities with future projects or development.

Executive Summary (Engineering Judgement/Recommendation) :

ADA Coordinator Concur

Signature _____

Design Engineer Concur

Signature _____

Project Manager Concur

Signature _____

ADE-Design Approval

Signature _____

FORM 6.1

CHAPTER 6, APPENDIX F

PARKING REMOVAL LETTERS

DATE

Municipality Contact Person
Municipality Name
Street Address
City, State Zip Code

**Subject: Notice of Future PennDOT Construction Project: Americans with Disabilities
Act Compliance and Removal of On Street Parking**

County:
Municipality Name
SR _____, Section _____
Project Length: _____
Project Name: _____
MPMS Number: _____

Dear Municipality Contact Person:

The Pennsylvania Department of Transportation is planning a roadway alteration project within your [city/township/borough] which will affect the use of the public right-of-way.

The Americans with Disabilities Act (ADA) of 1990 is a civil rights statute that, among other things, defines the requirements for access to public programs and facilities by persons with disabilities. The implementing regulations for Title II of the ADA make clear that designing and constructing pedestrian facilities in the public right-of-way that are not accessible by persons with disabilities may constitute impermissible discrimination. Section 504 of the Rehabilitation Act of 1973 (504) includes similar prohibitions in the conduct of federally-funded programs.

All projects affecting the use of the public right-of-way must therefore incorporate needed pedestrian access measures within the scope of the project. Specifically, all pedestrian facilities within the scope of the project must comply with the current ADA standards and any locations missing a required pedestrian facility are subject to corrective action during construction of the project.

Along SR [_____] there is/are (##) "T" intersection(s) with on street parking directly across from the corners. The on street parking at these "T" intersections prevents the installation of a pedestrian crossing of the SR that would be safe for all users. PennDOT recommends that the appropriate number of on street parking spaces be removed at these intersections to allow a safe and accessible crossing to be established. [Municipality Name] should evaluate the necessary steps required to restrict parking in these locations. Please see attached sketches indicating the "T" intersections, affected parking spaces and proposed crossing details.

We desire to meet with you within the next two weeks to discuss ADA accessibility issues, appropriate cost sharing, utility or right-of-way concerns, and future maintenance responsibilities for this project. The individual listed below will contact you to set-up a meeting date.

Please direct all correspondence to the following contact:

PennDOT Engineering District 0-0

Contact Person

Street Address

City, State Zip Code

Telephone: (000) 000-0000

E-mail: xxxxx@pa.gov

Sincerely,

Project Manager's Name

Title

DATE

Municipality Contact Person
Municipality Name
Street Address
City, State Zip Code

VIA CERTIFIED MAIL

RE: Failure to remove on street parking to provide pedestrian accommodations

Dear Municipality Contact Person:

As indicated in the letter dated [Date] and the follow up meeting held on [Date], the Pennsylvania Department of Transportation plans to improve SR [] through roadway alterations that include [describe alteration work and location], which is under the jurisdiction of [Municipality Name]. To meet current accessibility standards required by the Americans with Disabilities Act (ADA), altered pedestrian facilities must meet the latest design standards. It has been determined that [Municipality Name] has not taken action to remove on street parking located at the "T" intersection(s) (see attached summary) along SR [] necessary for the establishment of a fully accessible crossing.

Due to the sight distance issues caused by [Municipality Name]'s lack of action regarding parking, PennDOT will not be able to install accessible pedestrian facilities at this/these intersection(s). [Municipality Name] must take appropriate action to prohibit pedestrian crossing at the intersection(s) referenced above. Complaints relating to the lack of accessibility under the ADA will be referred to [Municipality Name.]

Thank you for your attention to this matter. If you have any questions, please contact Contact Person at (000) 000-0000.

Sincerely,

Project Manager's Name
Title

CHAPTER 7

DRIVEWAYS

Refer to Publication 13, Design Manual Part 2, *Contextual Roadway Design*, Chapter 6, Intersections and Driveways.

CHAPTER 8

LANDSCAPE PLANTING DESIGN (ROADSIDE DEVELOPMENT)

Refer to Publication 13, Design Manual Part 2, *Contextual Roadway Design*, Chapter 22, Landscape Planting.

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CHAPTER 9

SAFETY REST AREAS AND WELCOME CENTERS

Refer to Publication 13, Design Manual Part 2, *Contextual Roadway Design*, Chapter 24, Rest Areas and Welcome Centers.

CHAPTER 10

DRAINAGE DESIGN AND RELATED PROCEDURES

Refer to Publication 13, Design Manual Part 2, *Contextual Roadway Design*, Chapter 10, Drainage Design and Related Procedures.

CHAPTER 11

PAVEMENT DESIGN

11.0 INTRODUCTION

The policies, guidelines and procedures for the construction, restoration, rehabilitation, resurfacing and reconstruction of pavement structures for all Department projects shall conform to the current Publication 242, *Pavement Policy Manual*.

CHAPTER 12

GUIDE RAIL, MEDIAN BARRIER AND ROADSIDE SAFETY DEVICES

Refer to Publication 13, Design Manual Part 2, *Contextual Roadway Design*, Chapter 12, Roadside Design.

CHAPTER 13

EROSION AND SEDIMENT POLLUTION CONTROL AND POST CONSTRUCTION STORMWATER MANAGEMENT

13.0 INTRODUCTION

Pennsylvania's Clean Streams Law of 1937 (Act 394), as amended, prohibits the discharge to the waters of the Commonwealth of any pollutive materials whether from industrial or domestic sources. It also allows the Pennsylvania Department of Environmental Protection (PA DEP) to regulate any activity which creates a danger of pollution or has a potential for pollution. Pennsylvania's programs for the control of erosion and sediment pollution and for post-construction stormwater management have been adopted under the authority of 25 PA Code Chapter 102 (Erosion and Sediment Control). To explain the requirements of these programs pursuant to Chapter 102, PA DEP published in April 1990 an implementation manual titled, "Erosion and Sediment Pollution Control Program Manual" (updated in March 2000 and again in March 2012); and in December 2006 published, "Pennsylvania Stormwater Best Management Practices." Other related programs adopted by PA DEP are Chapter 105 (Dam Safety and Waterway Management) and Chapter 106 (Flood Plain Management) regulations. Pertinent regulations regarding the Storm Water Management Act of 1978 (Act 167) are addressed in [Section 13.7](#).

Also, as stipulated in the Federal-Aid Policy Guide, 23 CFR 650, Subpart B, it is the policy of the Federal Highway Administration (FHWA) that Federal-aid highways and highways constructed under the direct supervision of FHWA shall be located, designed, constructed and operated according to standards that minimize erosion and sediment damage to the highway and adjacent properties and abate pollution of surface and ground water resources.

Water pollution degrades surface waters making them unsafe for drinking, fishing, swimming, and other activities. As authorized by the Federal Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or human-made ditches. In most cases, the NPDES permit program is administered by authorized states. Since its introduction in 1972, the NPDES permit program is responsible for significant improvements to our Nation's water quality. [Section 13.6.C](#) discusses the NPDES permit program for Pennsylvania in greater detail.

Soil erosion is the process by which the land surface is worn away by the action of wind, water, ice and gravity. Under natural conditions, erosion occurs at a very slow and uniform rate and is a vital requirement in maintaining environmental balance. Sedimentation is the process involving the gravitational deposit of transported material in flowing or standing water. Erosion and sedimentation are normal geologic processes and are a matter of concern when accelerated by highway related activities. Such activities include the removal of the natural protective vegetative cover, the disturbance of the soil or other significant changes in topography.

The disturbance of land during construction is frequently accompanied by sudden, drastic increases in soil erosion. This accelerated erosion can be minimized by prudent scheduling of construction activities. Control measures can reduce sediment production. PA DEP's Chapter 102 regulations require that all persons proposing or conducting earth disturbance activities to develop, implement and maintain erosion and sediment pollution control measures to minimize the potential for accelerated erosion and sedimentation and to manage post-construction stormwater. [Section 13.1](#) provides highlights of the Chapter 102 regulations.

13.1 CONSIDERATIONS RELEVANT TO CONSTRUCTION

Effective erosion control planning begins during the preliminary design phase of highway project development. Control of construction activities and knowledge of the soils encountered are basic to determine measures for preventing erosion and the movement of sediment. Control measures shall be designed to fit the environment, topography, soils, rainfall, land use and construction schedules. A highway location selected with consideration of the problems associated with these basic elements can greatly reduce erosion problems during and after construction.

Prevention of sediment pollution of waterways involves the following principles: (1) schedule construction activities to reduce soil area exposed; (2) control erosion at the source; (3) control water that flows across the right-of-way and (4) perform timely seeding and mulching operations to stabilize disturbed areas as soon as possible. The key to controlling sediment pollution is to control soil erosion at the source.

Special precautions should be taken in the use of construction equipment to prevent operations which promote erosion. Wheel tracks from heavy equipment are vulnerable to erosion from the concentration of water. Fording of streams with equipment shall be kept to a minimum and, where required, shall be performed in accordance with the requirements of [Chapter 10](#), Drainage Design and Related Procedures, and regulatory permit requirements. Regulatory permit requirements take precedence over any design manuals.

Embankment slopes that encroach on or near stream channels should be adequately protected against erosion. Where possible, a protective buffer of vegetative cover should be preserved or established between the top of cuts or bottom of fills and the adjacent ditch or drainage way. The buffer area should be identified on the typical sections and plans and protected from construction activity.

Borrow pits and waste disposal areas should be selected with full consideration of erosion control requirements during borrow or disposal operations and during the final treatment or restoration of the area. Wherever located, special precautions shall be taken to control erosion and sediment problems and off-site effects. The disposal of waste in wetlands or in the flood channel area of any stream is prohibited. Regardless of the responsibility of the selection of borrow areas, plans of operation and of restoration, cleanup, shaping, seeding and mulching shall be approved by the Engineer.

Plans for the control of runoff must include measures to keep sediment from entering waterways before borrow or disposal operations begin. Diversion channels and sediment traps or sediment basins may be used for this purpose. Topsoil from the borrow pit area shall be salvaged for use in restoring the borrow area. Topsoil from a waste area should also be salvaged if it is needed for restoration. Stockpiled topsoil shall be protected from erosion. Final restoration of borrow and waste disposal areas shall include grading, establishment of vegetative cover and other treatments that blend the area into the surrounding landscape. The restored areas shall be well drained, unless approval is given to convert the pit area into wetlands or lakes for fish and wildlife, recreation, stock water or irrigation. Erosion and sediment pollution control shall be provided and maintained at wetland mitigation sites until they become established.

Where practical, erosion and sediment pollution control measures, also referred to as best management practices (BMPs), should be located within the normal right-of-way. However, when necessary, additional right-of-way acquisition may be required and shall be considered prior to completion of the right-of-way plans. If erosion and sediment pollution control measures will be removed during the construction contract, a temporary area for construction may be utilized. The control of the water across the right-of-way shall be completed prior to or concurrent with clearing and grubbing for the roadway. This may require offsetting the culverts from the natural drainage course to transport the water across the work area. All earth ditches or channels shall be stabilized before use to prevent erosion. Runoff from work areas shall be collected and controlled prior to entering a natural watercourse. All water originating outside of the project should be kept separate from that originating within the construction area.

Accelerated erosion can be minimized by the use of the following: (1) slopes which are rounded and blended into the natural terrain; (2) drainage channels properly designed with regard to location, width, depth, slope alignment and protective treatment; (3) proper facilities for ground water interception; (4) dikes; (5) berms and other protective devices; (6) protective ground covers and plantings and (7) properly designed sedimentation removal devices.

Erosion and sediment pollution control BMPs should be indicated on the construction drawings, as required, and so located that they do not interfere with the normal construction operations. The use of several smaller BMPs off the main stream has the advantage of not interfering with fish life and has less detrimental consequences in case of failure or overtopping of BMPs, since failure from overtopping is not likely to occur at all of the small BMPs simultaneously. BMPs located within a waterway may require a Chapter 105 permit from PA DEP.

Most erosion and sediment pollution control BMPs will be temporary, since most of the soil erosion occurs only during construction. Permanent detention basins provided for stormwater management purposes may be used as sediment basins during highway construction. Those basins located in a regulated watershed pursuant to the Storm

Water Management Act shall be designed and constructed in accordance with the standards of the individual watershed stormwater management plans. In some special cases, a multipurpose detention basin may be installed to provide water quality and wildlife habitat enhancements. Permanent erosion and sediment pollution control BMPs shall have a plan of maintenance. Temporary erosion and sediment pollution control BMPs shall be cleaned and maintained to assure proper functioning for the expected period of use. Some basins or ponds, because of size or location, may require protective fencing to limit unauthorized access.

Erosion and sediment pollution control BMPs shall be provided for all phases of construction activities including those items which are not normally specified in construction drawings. These BMPs also may be required for testing operations such as those for archeology and drilling.

13.2 SEEDING AND MULCHING STABILIZATION

Seeding with various grass or grass and leguminous plant mixtures is necessary to restore vegetative cover to soil surfaces exposed during excavation operations. Restoring the vegetative cover with deep-rooted, long lived and persistent adapted plant species is the most effective measure to prevent extensive soil erosion and any accompanying sedimentation loss and deposit in undesired areas. The use of permanent or temporary seeding or temporary mulching must be anticipated during earthwork operations.

A. Standard Highway Seeding Mixtures. Publication 408, *Specifications*, Section 804 lists several standard seeding mixture formulas which should be used on typical construction slopes for highway construction projects. A general description and guideline for their use is as follows:

1. Formula B. This is a refined lawn type, sod forming grass formula containing a large percentage of Kentucky bluegrasses with perennial ryegrass and red fescues. This mixture is generally used on non-steep surfaces where a more highly maintained and mowed surface, such as a lawn, is desired. Use only on areas which have topsoil.
2. Formula C. This is a mixture of predominantly crownvetch (leguminous plant) with a nurse crop of annual ryegrass. The ryegrass will hold the soil in place until the slower growing crownvetch establishes itself. This mixture is generally used on slopes steeper than 1V:3H where mowing is not anticipated or desired. Crownvetch is the state's official Soil Conservation Plant. Crownvetch will normally hinder the invasion of adjacent native vegetation for many years. Topsoil application is not necessary in areas to receive Formula C. Do not use within 20 ft of areas where evergreen trees, shrubs, seedlings or vines are to be planted.

Although this plant species is good for erosion control, Formula C has the capability of moving beyond the right-of-way. It can "creep" over and shade out other low growing vegetation. It can also cling to low hanging branches and onto right-of-way fence. The Pennsylvania Department of Conservation and Natural Resources (DCNR) considers Formula C to be a problematic, invasive plant in certain areas when it establishes outside of the right-of-way into residential and agricultural properties or other native plant communities.

3. Formula D. This is a rougher grass type, sod forming mixture containing a large percentage of tall and fine fescues. This mixture is generally used on most highway slope areas not receiving Formula C where mowing may or may not be designated. In non-mowed areas, this formula will eventually allow invasion and succession by adjacent native woody plants or wildflowers. Normally used in drainage channels or swales requiring permanent seeding.
4. Formula E. This is a 100% crop of annual ryegrass which is generally used to quickly stabilize exposed soil surfaces since it generally germinates within 2 weeks when climate conditions are favorable. Since the life cycle of this grass averages 1 to 2 years, this formula is considered most often for temporary use on unfinished graded areas during construction.
5. Formula L. This is a fine textured, sod forming mixture of hard fescue, red fescue with a nurse crop of annual ryegrass. This mixture can be used on low maintenance slope areas which will not be normally mowed and on flatter areas which will not receive more than 2 mowing cycles per year. Mixture should not be used where mowing height will be less than 6 in. Cutting less than 6 in is severely detrimental to establishment. Mixture has limited seedhead production and is not very adaptive to consistently wet soil conditions.

6. Formula W. This is a rough textured blend of tall fescue and birdsfoot trefoil (leguminous plant) with a nurse crop of redtop. This formula can be used on a wide assortment of conditions ranging from fairly dry to fairly wet soils where non-mow conditions are desired such as wetland replacement areas or wildlife habitat areas. This formula will eventually allow the desired invasion and succession of adjacent native plant material.

All areas of use for each seed formula will be shown on applicable typical sections and on the tabulation sheets.

Crownvetch crowns or potted plants can be used in lieu of Formula C seeding where a more positive and earlier establishment of crownvetch cover is essential or where successful seeding is questionable such as top of cut slopes or in areas of poor, erosive soil. Space plants 3 ft × 3 ft in a diamond pattern or under extreme conditions, 2 ft × 2 ft. Show areas of use and spacing on applicable Typical Sections and on the Tabulation Sheets. Potted plants of flatpea may also be used in this way to establish a quicker vegetative cover.

Other seeding formulas for various specialty areas such as wetland replacements, wildlife habitat areas, wildflower establishment or other soil conservation areas can be developed on a project by project basis.

Permanent soil protection and drainage facilities should be completed as early as practical, particularly diversion channels and similar controls that will divert runoff from work areas and unprotected soil. Areas of bare soil and the length of their exposure to erosion processes should be minimized by the following:

1. Temporary Seeding. When project areas are constructed in a rough graded condition and erosion may be accelerated, or establishment of a temporary vegetative cover on exposed soil areas is desired, specify Formula E, according to Section 804 and mulch according to Publication 408, *Specifications*, Section 805. Mulch alone (such as wood chips, straw, hay or other approved material) can be used to protect constructed slopes and other bare areas brought to finished grade when seeding operations are unfavorable. In all cases, temporary seeding and/or mulching will be installed on all disturbed areas where additional grading, topsoiling, etc. will not occur for 20 or more days.
2. Permanent Seeding. When project areas are constructed to finished grade and seeding operations are required within the dates specified in Publication 408, *Specifications*, Section 804.3(a), specify Formulas B, C, D, W, L or other approved seed formulas to minimize erosion by timely scheduling and limiting the work areas. Immediately begin permanent seeding and mulching operations as ground surfaces are brought to final grade.

Limit the use of sod to situations where new construction adjoins established lawns or other fine turf or where the immediate establishment of vegetative cover is required (i.e., between sidewalks and curb).

All seeding, soil supplements and mulching items shall be placed in accordance with the requirements of Publication 408, *Specifications*, Sections 804 and 805 or other approved special provisions.

B. Other Soil Conservation Seed Mixtures. Seeding mixtures of soil conservation type plantings for areas within the right-of-way limits other than typical highway construction slopes can include other seed types than the specified seed formulas listed in Publication 408, *Specifications*. These areas could include habitat replacement areas, wetlands, ponds, dam or stream banks, dikes, spillways, spoil areas, borrow pits or other special areas affected by the highway construction.

Some persistent type species for consideration are:

Legumes

Crownvetch
Birdsfoot Trefoil
Flatpea
Showy Tick Trefoil

Grasses

Tall Fescue
Deertongue
Big Bluestem
Little Bluestem
Redtop
Switchgrass
Fine Fescues
Indiangrass

Other useful species include: Weeping Lovegrass and Perennial Ryegrass.

Recommended Seed Varieties

- * Indiangrass - 'Rumsey', 'Holt' or 'Lometa'
- * Tall Fescue - 'Kentucky 31' for low maintenance sites, turf-type varieties for high maintenance sites. If endophyte - free tall fescue is desired, use 'Johnstone', 'Barcel' or 'Festorina'.
- * Perennial Ryegrass - Any fine-leaf turf-type variety
- * Fine Fescue - Any named variety
 - Redtop - Common seed, 'Streaker' or other named varieties
 - Switchgrass - 'Blackwell' for droughty site, 'Shelter' for habitat, 'Cave-in-Rock' for forage, 'Alamo'
 - Deertongue - 'Tioga'
- * Birdsfoot Trefoil - Any two of the following: 'Empire', 'Norcen', 'Leo', 'Maitland' or 'Dawn'
- Flatpea - 'Lathco'
- Weeping Lovegrass - Common seed or 'Morpa'
- * Crownvetch - 'Penngift'
- Big Bluestem - 'Niagara' or 'Kaw'
- Little Bluestem - 'Aldous', 'Camper' or 'Blaze'

- * Use named varieties that originated in Pennsylvania or Northeastern United States whenever possible since they are generally more resistant to unfavorable soil conditions than are varieties of the same plant kind that originated in Midwest or western states.

C. General Design Guidelines.

1. Lespedeza species are often recommended in various literature as a good cover and food source for wildlife. However, Lespedeza species are not recommended for use in Pennsylvania due to survival limitations caused by varying climate conditions and its limited seed production.
2. Simple mixtures are easier to seed, establish and manage than complex mixtures containing 6 or more species.
3. Most species used for conservation plantings will only root where pH soil conditions are within a range of 5.5 to 7.0 and sufficient fertility is available to support plant growth.
4. For best results, seed in spring during March, April and May.
5. Grasses generally require 4-5 weeks of growth prior to hard frosts in order to survive winter conditions.
6. Legumes generally require 10-12 weeks to produce a seedling large enough to survive winter conditions. Seed legumes before July 15th in northern and western Pennsylvania and before August 15th in southeastern Pennsylvania. If seeding is necessary later than these dates, specify at least 30-35% or more of the legume seed to contain hard seed.
7. Inoculate legume seeds immediately prior to seed application with a selected culture of nitrogen fixing bacteria.

D. Species Guidelines (Also see [Table 13.1](#)):

1. Birdsfoot Trefoil (*Lotus corniculatus*):
 - a. Does not spread vegetatively from roots but spreads readily from seed. Perennial legume, deep rooted, long lived, prolific seed producer. Adaptable to wide range of soil types and moisture requirements. Will tolerate imperfectly drained soils.
 - b. Adapted over the entire state, except in the extreme southeast, where crown and root rot may injure stands.
 - c. Establishment can be suppressed by excessive competition from associated species.
 - d. Showy yellow flowers during summer.
 - e. Provides good food source and cover for many types of wildlife.
2. Perennial Ryegrass (*Lolium perenne*) and Annual Ryegrass (*Lolium multiflorum*):
 - a. Substitute approved perennial ryegrass varieties for annual ryegrass in most mixtures, since the vigorous annual ryegrass can prevent or retard the longer-lived but slower establishing grasses or legumes from becoming established.
 - b. Rye grasses germinate and establish relatively quickly if soil and climate conditions are optimum.
 - c. Use "turf" type varieties of perennial ryegrass.
3. Redtop (*Agrostis alba*):
 - a. Do not exceed recommended application rates. Seeds are very small and numerous. Excessive seeding rate can retard or suppress establishment of more persistent species in a mixture. Rapid germination under good conditions.
 - b. Creeping growth habit forming a coarse, loose turf, short lived.
 - c. Very adaptable to poor soil and wet or dry soils.
4. Weeping Lovegrass (*Eragrostis curvula*):
 - a. Short lived, perennial, "warm season" grass, often winter kills under Pennsylvania conditions. Drought resistant. Tolerant to low pH and aluminum soils such as reclaimed strip mined soils where high-sulfur material has been unearthed.
 - b. Useful in mixtures since it furnishes a quick cover until slower growing species such as deertongue can become established. Will not establish as quickly as ryegrass or some cereal grains.
 - c. Do not exceed recommended application rate since seeds are very small and numerous. Excessive seeding rate can suppress other specie development.
5. Switchgrass (*Panicum virgatum*):
 - a. Range type, bunch perennial "warm season" grass. Long-lived and deep rooted with good tolerance to relatively low soil pH and low fertility.
 - b. May often require 2-3 years or more to develop an acceptable dense vegetative cover.

- c. Good for mine spoil areas and wildlife habitat replacement areas.
 - d. Compatible with Birdsfoot Trefoil.
6. Deertongue (*Panicum clandestinum*):
- a. Do not plant in mixtures with Tall Fescue, Fine Fescues, Kentucky Bluegrass, Redtop, Reed Canarygrass, Annual or Perennial Ryegrasses, Crownvetch or Flatpea since it will not tolerate competition from these species.
 - b. May often require 2-3 years or more to develop an acceptable dense vegetative cover.
 - c. Seed 2-3 years old if of high vigor often germinates more readily than seed from previous years harvest.
 - d. Stratification of seed for 3-4 weeks at a temperature of 35-45 °F is often helpful in breaking seed dormancy.
 - e. Perennial "warm season" grass, useful in acid or infertile soils and droughty and moist soils.
 - f. Compatible with Birdsfoot Trefoil.
7. Crownvetch (*Coronilla varia*):
- a. Perennial legume, somewhat slow to establish. Once established, it is a long lived, very vigorous grower and tends to dominate stands because of its ability to produce new plants from its roots.
 - b. Suppresses invasion of other plant species. Will "climb" onto fences and other low vegetation within reach.
 - c. Can also be planted using potted plants and crowns.
 - d. Herbaceous top growth dies back to ground each year.
 - e. Does best in a well-drained soil with pH of 6.0 or above, but has also been successfully established in soils with a pH as low as 5.4.
8. Flatpea (*Lathyrus sylvestris*):
- a. Perennial, persistent, long lived, legume. Provides a dense mat of foliage.
 - b. Once established, it is very vigorous and spreads by underground rhizomes. Normal two year establishment.
 - c. Suppresses other invasive vegetation.
 - d. May also be planted using potted plants.
 - e. Food source and cover plant for many types of wildlife.
 - f. Herbaceous top growth dies back to ground each year.
 - g. Requires a well-drained soil with pH of 6.0 or above.

9. Tall Fescue (*Festuca arundinacea*):
 - a. Aggressive, deep rooted, tufted, long lived perennial.
 - b. Grows well on wet, poorly drained soil but also on drier soils and soils of low fertility. Withstands hot, dry weather.
 - c. Spreads by short underground stems.
10. Fine Fescues (*Festuca* spp):
 - a. Fine fescues include Creeping Red, Chewings, Hard and Sheep fescue.
 - b. Finest leaf of any lawngrass. Blends well with most other "cool-season" grasses.
 - c. Usually used in combination with another grass and a legume for soil conservation purposes.
 - d. Tolerates a wide range of light conditions from full sun to fairly dense shade.
 - e. Tolerates dry soils but does poorly on saturated soils. Performs well on roadsides with infrequent high mowing.
 - f. Not overly competitive in seedling stage. Fairly rapid germination and seedling establishment.
11. Big Bluestem (*Andropogon gerardi*)
 - a. Tall growing, perennial, deep rooted, vigorous bunch grass, sod forming. More drought tolerant than other "warm season" grasses. Grows 3 to 6 ft tall.
 - b. Grows well on most soil types but can be used on excessively drained soil with low water holding capacity. Good tolerance to low pH and low fertility. Can be used on coal waste areas or strip-mined soils.
 - c. Generally takes 2 years to reach its maximum growth potential because of slow germination and seedling growth.
 - d. Seed is chaffy and will not flow well unless debearded. Specify 'Debearded' seed only. (Note: There are several specially designed seedbox seeders that will accommodate 'fluffy' seed.)
 - e. Important forage grass in the Midwest prairie states.
 - f. Wildlife use by songbirds and white-tailed deer for food and for nesting and escape cover.

Refer to [Table 13.2](#) for various seed mixtures recommended for permanent cover for soil conservation planting areas.

Other seed mixtures than those listed in [Table 13.2](#) may also be developed for selected areas but shall be approved by the Bureau of Project Delivery, Highway Delivery Division, Highway Design and Technology Section.

Refer to [Table 13.3](#) for various specialty soil conservation areas where the recommended seed mixtures listed in [Table 13.2](#) can be used.

Refer to [Table 13.4](#) to convert the seeding rates listed in [Table 13.2](#) to lb/1000 SY which is the standard area measurement for Department seeding applications.

TABLE 13.1
SPECIES FOR EROSION CONTROL AND
SOIL CONSERVATION PLANTINGS

SPECIES	GROWTH HABIT ¹	TOLERATES					PERSISTENCE ³	MINIMUM SEED SPECIFICATIONS ⁵				
		WET SOIL	DRY SITE	LOW FERTILITY	ACID SOIL (Ph 5-5.5) ²	ALUMINUM ³		PURITY (%)	READY GERM (%)	HARD SEED (%)	TOTAL GERM (%)	SEEDS/lb (1000's)
Warm-Season Grasses												
Deertongue grass	bunch	yes	yes	yes	yes	H	L	95	75	—	75	250
Weeping lovegrass	bunch	no	yes	yes	yes	M	S to M	97	75	—	75	1500
Switchgrass	bunch	yes	yes	yes	yes	M	L	95	75	—	75	390
Big Bluestem	bunch	yes	yes	yes	yes	M	L	60 PLS				150
Cool-Season Grasses												
Tall fescue	bunch	yes	no	yes	no	L	M to L	95	80	—	80	227
Redtop	sod	yes	yes	yes	yes	L	M	92	80	—	80	5000
Fine fescues	sod	no	no	yes	no	L	L	95	80	—	80	400
Perennial ryegrass	bunch	yes	no	no	no	L	S to M	95	85	—	85	227
Annual ryegrass	bunch	yes	no	yes	no	L	S	95	85	—	85	227
Legumes												
Crownvetch	sod	no	yes	yes	no	L	L	98	40	30	70	120
Birdsfoot trefoil	bunch	yes	no	yes	yes	L	L	98	60	20	80	400
Flatpea	sod	no	no	yes	yes	L	L	98	55	20	75	10

NOTES

¹ Growth habit refers to the ability of the species either to form a dense sod by vegetative means (stolons, rhizomes, or roots) or to remain in a bunch or single plant form. If seeded heavily enough, even bunch formers can produce a very dense stand. This is sometimes called a sod but not in the sense of a sod formed by vegetative means.

² Once established, plants may grow at somewhat lower pH, but cover generally is only adequate at pH 6.0 or above.

³ Tolerance to aluminum is relative. Soil and spoils must be limed to a pH of 5.5 to 5.7 to eliminate possible aluminum and manganese toxicity. Tolerance ratings: H = high; M = medium; L = low.

⁴ Persistence under favorable conditions: L = long duration; M = moderate duration; S = short duration (1 year or less).

⁵ MINIMUM SEED SPECIFICATIONS ARE TRULY MINIMUM, AND SEEDLOTS TO BE USED FOR REVEGETATION PURPOSES SHOULD EQUAL OR EXCEED THESE STANDARDS. Thus, deertongue grass should germinate 75% or better. Crownvetch should have at least 40% readily germinable seed and 30% hard seed. Commonly, seedlots are available that equal or exceed the minimum specifications. Remember that disturbed sites are adverse for plant establishment. Ready germination refers to seed that germinates during the period of the germination test and that would be expected, if conditions are favorable, to germinate rapidly when planted. The opposite of ready germination is dormant seed, of which hard seed is one type.

TABLE 13.2
RECOMMENDED SEED MIXTURES FOR PERMANENT COVER
FOR SOIL CONSERVATION PLANTINGS

MIXTURE NUMBER	SPECIES	SEEDING RATE (lb/acre) PLS**	
		MOST SITES	ADVERSE SITES ****
1 ***	tall fescue, or	60	75
	fine fescue	35	40
	plus redtop*, or	3	3
	perennial ryegrass	15	20
2	birdsfoot trefoil, plus	6	10
	tall fescue, plus	30	35
	redtop*	3	5
3	birdsfoot trefoil, plus	6	10
	crownvetch, plus	10	20
	tall fescue	20	30
4	flatpea, plus	20	30
	tall fescue, or	20	30
	perennial ryegrass	20	25
5	tall fescue, plus	40	60
	fine fescue	10	15
6	deertongue grass, plus	15	20
	weeping lovegrass*, plus	1	1
	birdsfoot trefoil	6	10
7	switchgrass, or Big Bluestem	15	20
	plus		
	weeping lovegrass*, plus	1	1
	birdsfoot trefoil	6	10

**** Soil conditions that are very acidic, infertile, severely eroded or possibly toxic and where liming, fertilization or other seedbed preparations are difficult to accomplish.

*** This mixture suitable for frequent mowing. Do not cut shorter than 4 in.

** PLS means Pure Live Seed. PLS is the product of the percentage of pure seed times percentage germination divided by 100. For example, to secure the actual planting rate for switchgrass, divide 12 lb PLS by the PLS percentage shown on the seed tag. Thus, if the PLS content of a given seed lot is 35%, divide 12 PLS by 0.35 to obtain 34.3 lb of seed (35 percent PLS), the amount of seed required to plant 1 acre. All mixtures in Table 13.2 are shown in terms of PLS.

* Keep seeding rate of that recommended in table. These species have many seeds per pound and are very competitive. To seed small quantities of small seeds such as weeping lovegrass and redtop, dilute with dry sawdust, sand, rice hulls, buckwheat hulls, etc.

TABLE 13.3
SOIL CONSERVATION PLANTING AREAS

SEED MIXTURE APPLICATION, TYPE OF AREA	TABLE 13.2 SEED MIXTURE NUMBERS
Slopes and banks (non-mowed) (a) Well-drained (b) Variable drainage	4 or 7 2 or 3
Slopes and banks (mowed) (a) Well-drained	1 or 5
Gullies and eroded areas	2, 3 or 7
Conservation structures (a) Sod waterways, spillways and other frequent water flow areas (b) Drainage ditches (1) shallow, less than 3 ft (2) deep, non-mowed (c) Pond banks, dikes, levees, dams, diversion channels and occasional water flow areas	1 or 2 1 or 2 3 2 or 3
Sanitary landfill areas	2, 3, 6 or 7
Strip-mine spoils, mine wastes, fly ash, slag, settling-basin residues and other severely disturbed areas	2, 3, 4, 6 or 7

TABLE 13.4
SEEDING APPLICATION RATE CONVERSION CHART
1 acre = 43,560 SF = 4,840 SY

lb/acre	lb/1,000 SY	lb/acre	lb/1,000 SY
1	0.25 (4 oz)	15	3
2	0.5 (8 oz)	20	4
3	0.6 (10 oz)	25	5
4	0.8 (13 oz)	30	6.25
5	1	35	7.25
6	1.25	40	8.25
8	1.75	50	10.5
10	2	60	12.5
12	2.5		

Seeding design selections are also controlled by several physical and chemical factors which must be considered prior to selecting a seed mixture. Some design considerations are as follows:

1. Soil analysis including composition, acidity, fertility, moisture content or any toxic properties.
2. Site conditions such as full sun, partial or heavy shade as well as directional slope exposures.
3. Slope criteria including steepness, embankment (fill) or cut surfaces.
4. Desired long term or short term longevity of selected plants including plant specie competition from species in the mixture and from adjacent vegetation.
5. Anticipated maintenance requirements.

A logical guideline procedure for seeding design would include:

1. Carefully analyze any limiting site factors, both physical and chemical.
2. Select an appropriate combination of adaptable plant species.
3. Select an appropriate set of establishment procedures consistent with the needs of the plant species to be seeded and the need to overcome any limiting site factors.
4. Only use seed of proper plant species or varieties of high germination capacity and vigor.

The proper use of lime and fertilizers and the addition of various soil amendments can rectify many unfavorable soil conditions and result in establishing an adequate vegetative cover with desired species.

E. Specification Preparation and Approvals. Seeding specifications for soil conservation plantings shall be prepared to include the following format: (1) soil supplements, (2) specie selections, (3) purity and germination percentages, (4) application rates and (5) construction requirements.

Refer to [Figure 13.1](#) for seeding special provision format.

All seeding specifications and proposed seeding locations for soil conservation plantings shall be approved by the Bureau of Design and Delivery, Highway Design and Technology Division.

F. Seed Quality. All seed sold in Pennsylvania must, by law, have a tag or label listing the tested percentages of pure seed, inert matter, crop seed and weed seed as well as germination percentage and test date. Seed with a test date older than nine months should not be used.

Certified seed is the best assurance of obtaining seed of high physical quality and known genetic identity especially for named varieties. For erosion control and conservation plantings, seed should be high in germination and purity rates.

PLS (Pure Live Seed) is a method of defining the planting quality of chaffy seeds such as various wildflowers and switchgrass. The PLS number is calculated by multiplying the % of pure seed by the % of germination and then dividing by 100. Example: $72\% \text{ pure seed} \times 85\% \text{ germination} \div 100 = 61\% \text{ PLS}$. This allows the amount of seed required to be adjusted to compensate for low purity and germination (see [Table 13.2](#) note for an example of how the seed application rate is adjusted for the desired PLS number).

Generally "common seed" or seed of unknown genetic origin can be used for soil conservation plantings if certified seed is not available.

FIGURE 13.1 SPECIAL PROVISION FORMAT FOR SPECIAL SEEDING MIXTURES

SAMPLE SPECIAL PROVISION

Item 9804 - xxxx - Seeding and Soil Supplements - (Insert appropriate name)

DESCRIPTION - This work is furnishing and placing seed and soil supplements of the type specified.

MATERIALS -

- | | |
|---------------------------------------|-------------------|
| (a) Pulverized Agricultural Limestone | Section 804.2(a)1 |
| (b) Commercial Fertilizer | Section 804.2(a)2 |
| (c) Slow-Release Nitrogen Fertilizer | Section 804.2(a)3 |
| (d) Inoculant (When Applicable) | Section 804.2(c) |
| (e) Seed Formula | |

SEEDING RATE
lb/1000 SY

MIN%
PURITY/GERMINATION

MAX%
WEED SEED

(Insert Desired Seed Formula)

Seed to meet applicable requirements of Section 804.2(b) for seed tests, PA Dept of Agriculture regulations, PA Seed Act of 1965, Act No. 187 and delivery of seed to work area.

CONSTRUCTION -

Loosen or roughen soil surface on all areas to receive seed to a depth of at least 2 in.

Apply soil supplements in accordance with Section 804.3(c). Prior to project completion apply slow-release nitrogen fertilizer to soil surface.

When applicable, inoculate leguminous seed in accordance with Section 804.3(d).

Apply seed in accordance with Section 804.3(e). Spread seed where indicated and at the specified rate within the following dates, or as directed.

(Insert Desired Seeding Dates)

Follow Sections 804.3(i) and (j) for liability and maintenance requirements.

Mulch seeded area with straw in accordance with Section 805.

MEASUREMENT AND PAYMENT -

- | | |
|-----------------------------------|-------------------|
| (a) Seeding and Soil Supplements. | Pound. |
| (b) Mulching. | Section 805.4(a). |

Some seeds, generally unscarified seeds of legumes such as crownvetch, birdsfoot trefoil and flatpea may have a watertight seedcoat. The seedcoat is eventually broken by either frost action or microbial action and germination will then produce a seedling. Seeds impervious to water are termed hard seed. The percentage of hard seeds in a given lot is added to the percentage of readily germinating seed to yield the total germination percentage. Legume seed lots should contain a certain minimum amount of hard seed as an insurance factor.

G. Seed Bed Preparation. Prior to seed application, soil supplements such as pulverized agricultural limestone and various fertilizer applications are required to prepare the area to be seeded.

Formula E does not normally require any applications of soil supplements. However, separate applications of lime, fertilizer or both may be necessary to establish the temporary grass cover in certain situations where anticipated soil conditions would not be conducive to good grass germination and growth.

Formulas B, C, D, L and W require soil supplement applications as specified in Publication 408, *Specifications*, Section 804.

Special soil conditions may require altering the standardized soil supplement application rates. All revisions shall be approved by the Bureau of Project Delivery.

Finished slopes should be seeded and mulched in increments of approximately 15 ft with permanent in-season seeding at the full application rates specified for soil supplements, seed and mulch. If out-of-season seeding is approved, apply either the full specified quantities for supplements, seed and mulch or apply full supplements and 50% of the seed application rate to be followed by the remaining 50% within the next seeding dates. Full mulch rate applications will be required for each seeding application to prevent soil erosion until seed germinates.

H. Mulching. All seeded areas should be mulched with an appropriate approved mulch to reduce the potential for erosion while the seeds germinate. Mulch also aids seed germination by conserving moisture in the soil, encouraging water infiltration and helping to regulate soil temperature from excessive exposure to the sun's heat.

Several mulch materials such as straw, hay, wood fiber, pellet mulch and bonded fiber matrixes are approved for use with seeding operations. Wood chips have also been successfully used in some conservation type seeding areas if application depths are strictly followed.

1. **Straw.** This material is one of the most preferred and one of the least expensive mulches for most seeding operations. Use on all topsoiled areas. Straw needs to be secured in place with either approved mulch control binders or mulch control netting to prevent loss of material by natural winds or breezes caused by vehicular movement.
2. **Hay.** This material is more adaptable to steeper slope conditions than straw but is more apt to introduce undesirable weed seeds. This application may have wide use for development of wildlife habitat areas where it helps to introduce more diverse plant types. Use on untopsoiled areas. Hay needs to be secured in place with either approved mulch control binders or mulch control netting to prevent loss of material by wind.
3. **Wood Fiber.** This material is applied with hydraulic mulching/seeding equipment and after drying, provides a thin protective cover. Wood fiber does not provide as much erosion protection or moisture retention for seed germination as straw or hay. The wood fiber must adhere to the soil surface and its protective longevity is less than other mulches. Use on areas where fire hazard potential for straw or hay is high or where a less conspicuous mulch appearance is desired. No weed seeds are introduced with this material.
4. **Wood Chips.** Placing wood chips in thin mulch layers not deeper than 2 in has been successfully used in conservation type seeding areas. Thicker mulch layers of 3 in, 4 in or deeper can be used without seed in temporary areas to provide erosion control until the permanent soil surface is prepared.
5. **Pellet Mulch.** This mulch is compressed pellets of shredded recycled paper which lose their pellet shape and adhere to other pellets, after water application, to form a thin protective cover. Pellet mulch is best used on flatter areas where a more refined turf grass, such as a lawn, is desired. Pellet mulch will not blow away.

Pellets are applied using rotary or drop-spreader equipment; therefore, slope steepness must be considered. No weed seeds are introduced with this material.

6. Bonded Fiber Matrix (BFM). This mulch is composed of fibrous material bonded together with adhesive agents to form a continuous, porous, erosion resistant protective cover which also adheres to the soil surface. BFM must be applied using hydro-mulching/seeding equipment and is applied at higher rates than standard wood fiber mulch. Generally use BFM on steep slopes where access and soil preparation is difficult. Use also on flatter areas where tacked straw or hay are prone to blow away or as an alternate to erosion control mats or blankets on slopes. Avoid using in direct water flow areas such as ditches, channels and swale centerlines, etc.

All areas of mulch use for seeding will be shown on the applicable typical sections and on the tabulation sheets.

Apply mulches at the rates specified in Publication 408, *Specifications*, Section 805.

13.3 OTHER STABILIZATION METHODS

A. Discussion. In most flat slope areas and areas where water generally does not have a concentrated flow, applying only mulch to the seeded area will be sufficient to provide the initial protection until the grass cover is established. On steeper slope areas, highly erodible soils, and drainage channels, other erosion control material will be necessary to provide the required protection to the seed and soil. Erosion control mats and blankets are commonly used for these applications. Turf reinforcement mats can artificially reinforce or augment the grass surface to permanently increase or enhance its resistance to erosion, and reduce the risk of grass failure due to localized poor cover establishment.

On the other hand, there are situations where grass establishment is not the most appropriate or, perhaps, cost-effective means of stabilization. Acceptable non-vegetated stabilization options are listed below.

Design guidance for all of the stabilization measures listed below can be found in Publication 584, *PennDOT Drainage Manual*, Chapter 8, Open Channels and Chapter 12, Erosion and Sediment Pollution Control.

B. Approved Measures.

- 1. Rolled Erosion Control Products (RECPs).** Most provide temporary stabilization. Turf reinforcement mats are considered long-term, permanent stabilization measures.
 - a.** Mulch Control Netting.
 - b.** Open Weave Textile.
 - c.** Erosion Control Blanket.
 - d.** Turf Reinforcement Mat.
- 2. Spray on Mulches.** Method of applying mulch (usually also seed and fertilizer) as a spray from a hydraulic tanker truck.
- 3. Geocell Slope Confinement.** Cellular HDPE material that is typically used to stabilize steep side slopes.
- 4. Articulated Concrete Block Revetment System (ACBR).** Interlocking or tied blocks of concrete used to permanently stabilize slopes.
- 5. Gabions.** Wire baskets filled with stone or riprap that can be stacked and somewhat deformed, if necessary.

13.4 EROSION CONTROL MEASURES

A. Discussion. Erosion control measures, or Best Management Practices (BMPs) are used to prevent the erosion of earth by the forces in stormwater runoff. Erosion of unstabilized and unprotected earth can occur very easily. The previous section dealt primarily with protecting disturbed slopes while vegetation is being established or where vegetation alone is not sufficient. Most of the erosion control BMPs in this section are associated with the protection of slopes or channels receiving concentrated flow, such as from an upstream channel, pipe, or culvert.

B. Approved Measures. A number of erosion control BMPs that are appropriate for use on highway projects have been approved by the Department. The list below contains the names and brief descriptions of some of these approved BMPs. Additional information on these devices can be found in Publication 584, *PennDOT Drainage Manual*, Chapter 8, Open Channels and Chapter 12, Erosion and Sediment Pollution Control. Plan drawing details for most of the BMPs are located in the Publication 72M, *Roadway Construction Standards*; these should be included in the Erosion and Sediment Pollution Control (ESPC) Plan.

1. Channel Lining. Flexible (grass, RECPs, rock, etc.) or rigid (concrete) materials used to protect the underlying soil from erosion. Publication 584, *PennDOT Drainage Manual*, Chapter 8, Open Channels contains relevant design procedures and information.
2. Paved Energy Dissipator. Section of concrete channel lining containing partially embedded stones designed to dissipate energy in channels with velocities greater than 14 ft/s.
3. Rock Apron. Used to prevent scour and dissipate energy at pipe or channel outfalls where anticipated discharge velocities do not exceed 14.5 ft/s and where the apron can be installed on a level grade.
4. Rock Basin or Rock Energy Dissipator. Pre-formed scour holes that are used to dissipate energy and control erosion at pipe outlets where outlet velocities exceed the allowable limits of the soil or channel lining, but are 19 ft/s or less.
5. Stilling Well. Concrete energy dissipator constructed below grade at the outlet end of pipes and culverts.
6. Temporary Slope Pipe Drain. Installed to transport stormwater runoff safely down the face of a cut or fill slope to a stabilized area. Should be used prior to the installation of permanent facilities and/or growth of adequate ground cover on the slopes.
7. Diversion Ditch. Any type of channel that is constructed above a disturbed area to intercept and convey offsite runoff or runoff from undisturbed areas away from unstabilized areas.

C. Design Flows. In general, the temporary erosion control BMPs listed above must be designed to resist erosion for the 2-year storm event. Exceptions to this must be made for disturbances within Special Protection Watersheds (SPW) and for measures that will become permanent stormwater management or drainage facilities. Channels within a SPW must be provided with temporary lining able to resist erosion for the 5-year storm event. Permanent channel lining in any watershed must be resistant to erosion for the 10-year storm event, at a minimum. Temporary pipes, and outlet protection for temporary pipes, must be designed for the 2-year storm event (5-year storm event for SPW). Permanent outlet protection shall be designed for the maximum anticipated velocity from the discharging pipe.

13.5 SEDIMENT POLLUTION CONTROL DEVICES

A. Discussion. Sediment pollution control devices, which are also referred to as BMPs, are installed in and around construction sites to prevent sediments from being transported away from the site. Sediments can be carried off site by stormwater runoff and wind, or they can be attached to construction vehicles and deposited on roads adjacent to or near the site. Some sediment control BMPs temporarily hold runoff to allow sediments to settle out by gravity. Other BMPs filter runoff by straining sediment-laden water through a fine medium, such as filter fabric or gravel. The type of BMP used depends on the specific area of application.

B. Approved Devices. A number of sediment pollution control BMPs that are appropriate for use on highway projects have been approved by the Department. The list below contains the names and brief descriptions of the approved BMPs. Additional design and plan information on the devices listed in this section can be found in Publication 584, *PennDOT Drainage Manual*, Chapter 12, Erosion and Sediment Pollution Control. Plan drawing details for most of the BMPs are located in the Publication 72M, *Roadway Construction Standards*; these should be included in the ESPC Plan.

1. **Rock Construction Entrance.** Used to remove mud from the tires of construction vehicles leaving the site. Required whenever vehicular access onto unpaved areas is necessary.
2. **Rock Filter Outlet.** Used to replace damaged sections of silt barrier fence or to fill in space between the end of a section of silt barrier fence and a slope.
3. **Compost Filter Sock.** A perimeter control device that filters runoff in the form of sheet flow. Use at the bottom of disturbed slopes that would normally drain across the right-of-way line or into a channel. Consists of compost material wrapped in a geotextile container.
4. **Compost Filter Berm.** Same as compost filter sock, except that the compost is mounded instead of being wrapped in a geotextile container.
5. **Silt Barrier Fence.** Same application as a compost filter sock. Geotextile fabric is fastened to stakes that are driven vertically into the ground.
6. **Heavy Duty Silt Barrier Fence.** Should be used when slope lengths exceed the capacity of standard silt barrier fence. Fabric is reinforced with wire mesh backing and metal posts are used instead of wood stakes.
7. **Vegetated Filter Strip.** Well-established perennial grassy area located below a disturbed area used to remove sediment from runoff prior to it reaching receiving waters.
8. **Pumped Water Filter Bag.** Used to filter out sediments from water pumped from excavation holes associated with bridge piers and abutments. Also used to dewater trenches and filter water pumped from sediment traps and basins.
9. **Storm Inlet Protection.** Used to filter or settle out sediment in runoff from disturbed areas before it enters the storm sewer. Includes inlet filters, traps, and berms.
10. **Rock Barrier.** Temporary stone dam installed across a channel to remove sediment originating from flow in the channel before vegetation is fully established.
11. **Sediment Trap.** Temporary storage area used to detain sediment-laden runoff from small, disturbed areas. Types include embankment, Type M inlet, and riser sediment traps.
12. **Sediment Basin.** Large ponding area used to detain sediment-laden runoff from large, disturbed areas.

13.6 PREPARATION AND PROCESSING OF EROSION AND SEDIMENT POLLUTION CONTROL PLANS

A. Plan Preparation. In order to minimize accelerated erosion and to control sediment pollution during highway construction, proper preparation and adherence to implementation of the scheduled sequence of operation of ESPC Plans is of primary importance.

Erosion and sediment pollution control should be initially considered in the preliminary design stage and plans fully developed during the final design stage of a highway project.

The purpose of the ESPC Plan is to identify potential erosion problems and to define effective and economical measures to be used in conjunction with construction activities to minimize erosion and sediment pollution. The ESPC Plans for a project shall be prepared and processed in accordance with Publication 14M, *Design Manual*, Part

3, *Plans Presentation*, Chapter 6. All erosion and sediment pollution control BMPs shall be indicated by the applicable symbols presented in Publication 14M, *Design Manual*, Part 3, *Plans Presentation*, Chapter 13.

An ESPC Plan, as applied to Department projects, shall consist of three parts: (1) maps and drawings showing the topography of the area, the proposed alteration to the area and the erosion and sediment pollution control BMPs; (2) a narrative report describing the project and indicating the purpose and the engineering assumptions and calculations for control BMPs; and (3) detailed instruction in the contract proposal and/or the plan, as extracted from the narrative report data, to define staging, sequencing and scheduling of earthmoving activities and the installation of the erosion and sediment pollution control BMPs. The staging should be determined on the basis of such factors as: (1) drainage divide, (2) grade line direction, (3) efficient and economical construction operation, (4) earthwork balancing, (5) protection of traffic, and (6) maintenance consideration.

The following references located in Publication 584, *PennDOT Drainage Manual*, is useful information for developing PennDOT ESPC Plans:

- Chapter 8 – Design procedure and guidance for channel lining
- Chapter 12 – Design guidance for approved BMPs
- Chapter 12, Appendix B – Recommended notes for ESPC Plans
- Chapter 12, Appendix C – Recommended standards for ESPC Plans

B. Implementation and Maintenance. Implementation of the ESPC Plan on the project site and maintenance of BMPs thereafter are the responsibilities of the party performing the work, which is either the Department or the contractor. Every ESPC Plan shall contain a sequence of earthwork activities that includes installation and removal of all proposed temporary and permanent BMPs. The contractor will be responsible for implementing the plan per this sequence. Contractors shall also be notified of their responsibilities, which include but are not limited to the following:

- Ensure that the ESPC Plan is properly and completely implemented in accordance with the drawings and the technical specifications.
- Perform maintenance inspections on all BMPs after each rainfall event and, at a minimum, on a weekly basis, and document the inspections using inspection log sheets. All preventative and remedial work must be performed immediately.
- Obtain approval from the appropriate county conservation district or PA DEP regional office if deviation from the ESPC Plan is necessary or desired.
- Maintenance of all permanent BMPs becomes the responsibility of the owner in perpetuity upon completion of construction and acceptance by owner, subject to the terms of the warranty period specified in the contract documents.
- Fines and related costs resulting from the contractor's failure to provide adequate protection against soil erosion and for any violations of the Clean Streams Law and the rules and regulations promulgated thereunder shall be borne by the contractor.

These responsibilities and others specific to the project shall be described in the ESPC Plan. Maintenance instructions for each BMP to be used on a project must be provided on the plan.

C. Other Necessary Actions for Project Compliance. To assure compliance with regulatory requirements and to provide additional emphasis on erosion and sediment pollution control, necessary actions should be taken to comply with the following:

1. The ESPC Plans should be judiciously developed and implemented in accordance with the procedures and criteria specified in Publication 584, *PennDOT Drainage Manual*, Design Manuals, and Publication 72M, *Roadway Construction Standards*. If the proposed measures and facilities deviate from the specified procedures or criteria, it should be demonstrated that the alteration shall also result in prevention of accelerated erosion and sedimentation.

In general, only one ESPC Plan needs to be developed throughout the life of a project. This plan would normally cover all staged earthmoving activities. However, on major highway projects, it may be necessary to develop two or more control plans to address earthmoving activities which will occur before or after the prime construction project, or to be performed by a separate contractor or consultant.

2. A National Pollutant Discharge Elimination System (NPDES) permit is required for those highway projects in which the total project earth disturbance area is equal to or greater than 1 acre. In Pennsylvania, the NPDES permit program is delegated to and administered by PA DEP. PA DEP has delegated the management of the NPDES program to most of the County Conservation Districts. PA DEP and County Conservation Districts jointly regulate construction activities utilizing existing state regulations concerning erosion control and NPDES permits to implement the Federal requirements.

The 1972 amendments to the Federal Water Pollution Control Act (Clean Water Act or CWA) prohibit the discharge of any pollutant to Navigable Waters of the United States from a point source unless the discharge is authorized by a NPDES permit. The U.S. Environmental Protection Agency (EPA) has promulgated rules for the NPDES permit process:

- Phase I: Established in 1990, Phase I addresses discharges from large construction activities disturbing 5 acres or more of land.
- Phase II: Established on December 8, 1999, Phase II covers small construction activities that result in a land disturbance of equal to or greater than 1 acre and less than 5 acres. Site activities disturbing less than 1 acre are also to be regulated as a small construction activity if they are part of a larger common plan of development or sale with a planned disturbance of equal to or greater than 1 acre and less than 5 acres.

PA DEP issues two types of NPDES permits for Stormwater Discharges Associated with Construction Activities – a General Permit (PAG-2) and an Individual Permit. PAG-2 covers most projects; however, an Individual Permit is needed for projects in "special protection" watersheds (high quality, exceptional value, and exceptional value wetlands). Copies of the NPDES permit application forms, instructions, and other related documents are available through PA DEP's website (www.dep.pa.gov).

Each local municipality and county involved shall be notified, pursuant to Act 14, P.L. 834, to the effect that an application for the NPDES has been filed with PA DEP and the documentation of this notification included in the application submitted. No permit application fee is required for any application submitted by the Department. The NPDES shall be processed by the Engineering District through the County Conservation District, or PA DEP, according to the established procedure. If construction of the project can not be completed within the time limit normally specified in a permit, a longer time limit to cover the entire construction period should be requested when the permit application is submitted.

3. An NPDES permit is not required for those highway projects which involve a total project earth disturbance area of less than 1.0 acre. However, the erosion and sediment pollution control measures and plans must comply with PA DEP's Chapter 102 regulations.

4. Best Management Practices (BMPs) must be utilized for all earth disturbances, regardless of area. Standards for the BMPs are contained in Publication 584, *PennDOT Drainage Manual*, Chapter 12.

5. A written ESPC Plan must be prepared for projects that disturb 5000 ft² or more. (Note: Two additional conditions which may require a written plan are listed in PA Code Section 102.4(b)(2).)

6. An Erosion and Sediment Control Permit is required for roadway maintenance projects that disturb 25 acres or more.

7. Special protection BMPs are required when earth disturbance activities may result in a discharge into a water classified under Chapter 93 of the PA Code as High Quality (HQ) or Exceptional Value (EV), including EV wetlands.

8. The current standard special provisions for the ESPC, as indicated in the Department's Contract Management System, should be included in all applicable contract proposals.
9. The necessary ESPC practices must be fully implemented and monitored during the construction of the highway project.
10. One copy of the ESPC Plan should be sent by the Engineering District to the Central Office, Bureau of Design and Delivery, Highway Design and Technology Division for information and review at the time the plan is submitted to the County Conservation District.
11. The County Conservation Districts have been delegated responsibilities for PA DEP's Erosion and Sediment Control Program. Under this program, authority is delegated to Conservation Districts at three different levels: Level I, Level II, and Level III. Level I delegation (four counties) includes providing information on PA DEP's Erosion and Sediment Control Program, the review and processing of Erosion and Sediment Control Permit applications, and the review of Erosion and Sediment Control Plans. Level II delegation (51 counties) includes Level I responsibilities, plus responsibilities of complaint investigation and site inspections. Level III delegation (10 counties) includes Level I and II responsibilities, plus enforcement responsibilities such as administrative hearings, equity actions, summary or misdemeanor actions, and assessment of civil penalties.

In addition to the Erosion and Sediment Control Program, 60 Level II and III Conservation Districts are also delegated responsibilities for processing National Pollutant Discharge Elimination System (NPDES) Permits for Stormwater Discharges Associated with Construction Activities. (Note: Philadelphia County does not have a County Conservation District.)

12. During construction, it is encouraged that PA DEP's Area Office staff be contacted to assist in implementing the erosion and sedimentation control measures and facilities. All significant changes, additions and/or deletions to the plans approved with a permit which will affect erosion and sediment pollution controls shall be approved by PA DEP prior to construction.
13. Generally, individual PennDOT construction projects will be issued one NPDES permit for the entire project, and this permit will apply inclusively to borrow and spoil areas.
14. NPDES permits are issued during the final design phase.
15. After spoil and borrow areas are identified, and before any earth moving activities occur in them, ESPC Plans must be submitted and approved. Once approved, these ESPC Plans automatically become amendments to the project's original NPDES permit.
16. Since there is only one NPDES permit issued to PennDOT for the entire project, if this permit is violated and subsequently suspended or revoked, that action will affect the entire project.

13.7 ANTIDEGRADATION AND POST CONSTRUCTION STORMWATER MANAGEMENT POLICY

A. Introduction. The Department performs a broad spectrum of activities to maintain and improve the state's highway system. Construction activities involving earth disturbance often result in the need to manage stormwater runoff. A comprehensive approach is necessary to address the challenges associated with managing stormwater runoff from linear highway systems. The Department employs an "E⁵" strategy for addressing stormwater management issues. The goal is to integrate each of the E⁵ components into the overall design process to achieve a more sustainable and efficient program:

- Examine site characteristics and stormwater management needs early in the design process.
- Engage PA DEP through pre-application meetings.
- Encourage low impact practices for preventing runoff.
- Evaluate new technologies and assess the performance of existing ones in the field.
- Educate Department staff, consultants, and contractors on stormwater policy and implementation.

B. Definitions.

1. **3R Projects.** The term 3R stands for resurfacing, restoration, and rehabilitation. 3R projects typically involve pavement improvement work (short of full-depth replacement) and targeted safety improvements. 3R projects generally involve retention of the existing three-dimensional alignment.
2. **Antidegradation Best Available Combination of Technologies (ABACTs).** Defined in 25 PA Code Chapter 102. Environmentally sound and cost effective treatment, land disposal, pollution prevention and stormwater reuse BMPs that individually or collectively manage the difference in the net change in stormwater volume, rate, and quality for storm events up to and including the 2-year/24-hour storm when compared to the stormwater rate, volume and quality prior to the earth disturbance activities to maintain and protect the existing quality of receiving surface waters of this Commonwealth.
3. **Best Management Practices (BMPs).** Defined in 25 PA Code Chapter 102. Activities, facilities, measures, planning or procedures used to minimize accelerated erosion and sedimentation and manage stormwater to protect, maintain, reclaim, and restore the quality of waters and the existing and designated uses of waters within this Commonwealth before, during, and after earth disturbance activities.
4. **Combined Sewer Systems (CSSs).** Defined by 25 PA Code Chapter 92a. A sewer system that has been designed to serve as both a sanitary sewer and a storm sewer.
5. **Degradation.** For HQ and EV watersheds, degradation is an adverse effect that results in a negative change in the existing water quality of the receiving surface water. For non-HQ and non-EV watersheds, it is a negative change in the existing or designated in-stream water use or the level of water quality necessary to protect the use.
6. **Disturbed Area.** Defined in 25 PA Code Chapter 102. Unstabilized land area where an earth disturbance activity is occurring or has occurred.
7. **Ephemeral Stream.** Defined in 25 PA Code Chapter 89. A water conveyance which lacks substrates associated with flowing waters and flows only in direct response to precipitation in the immediate watershed or in response to melting snowpack and which is always above the local water table.
8. **Evapotranspiration (ET).** The sum of evaporation and plant transpiration of water. Evapotranspiration accounts for a significant portion of the rainfall that is lost (not returned to streams via surface runoff) in Pennsylvania watersheds. The amount of evapotranspiration is influenced mostly by the types of vegetation and land use in a watershed. Because water transpired through leaves comes from the roots, plants with deep reaching roots can more constantly transpire water. Thus, herbaceous plants transpire less than woody plants because herbaceous plants usually lack a deep taproot. Also, woody plants keep their structure over long winters while herbaceous plants must grow up from seed in the spring in seasonal climates and will contribute almost nothing to evapotranspiration in the spring.
9. **Impaired Stream.** A surface water that does not meet the water quality criteria for its designated or existing use under 25 PA Code Chapter 93. Streams are examined for four main uses: water supply, aquatic life, recreation, and fish consumption. PA DEP monitors surface waters for biology, chemistry, and physical habitat using methods outlined in the approved 2015 Assessment Methodology. Impaired waters are listed in Categories 4 and 5 of Pennsylvania's Integrated Water Quality Monitoring and Assessment Report.
10. **Impervious Area.** A surface that is compacted or covered with a layer of material so that it is resistant to infiltration by water, including but not limited to structures and buildings; non-porous asphalt and concrete; gravel roads, driveways and parking areas; land areas covered with significantly compacted and unvegetated soil such as dirt roads, driveways and parking/storage areas; and other surfaces routinely used for vehicle parking and movement.
11. **Infiltration.** The process by which surface water penetrates through the ground surface into the soil. The soil texture and structure, vegetation types and cover, water content of the soil, soil temperature, and rainfall intensity all play a role in controlling infiltration rate and capacity. For example, coarse-grained sandy soils have large spaces between each grain and allow water to infiltrate quickly. Vegetation creates more porous

soils by both protecting the soil from pounding rainfall (which can close natural gaps between soil particles) and loosening soil through root action.

12. Long Term Control Plan. A plan developed by municipalities and/or municipal authorities designed to mitigate the impact of combined sewer system discharges and meet water quality standards.

13. Municipal Separate Storm Sewer System (MS4). Defined by 25 PA Code Chapter 92a (and paraphrased here). A separate storm sewer (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, human-made channels or storm drains) which is owned or operated by a public body (created by or under State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater or other wastes; that discharges to surface waters of this Commonwealth; is designed or used for collecting or conveying stormwater; is not a combined sewer; and is not part of a publicly owned treatment works.

14. Net Change. Refers to the change from pre-development to post-development conditions.

15. New Construction. Roadways that are built on a new alignment.

16. Non-discharge Alternative. Defined in 25 PA Code Chapter 102. Environmentally sound and cost-effective BMPs that individually or collectively eliminate the net change in stormwater volume, rate and quality for storm events up to and including the 2-year/24-hour storm when compared to the stormwater rate, volume and quality prior to the earth disturbance activities to maintain and protect the existing quality of the receiving surface waters of this Commonwealth.

17. Off-site Discharge. An off-site discharge is a stormwater discharge to a non-surface water such as a swale, ephemeral channel, or ground surface via level spreader, that will flow through a property or properties not owned by the Department prior to reaching a surface water. This definition applies to both construction and post-construction discharges.

18. Pre-development. Refers to runoff condition that exists onsite immediately before the planned project occurs. Pre-development is not intended to be interpreted as the period before any human-induced land disturbance activity has occurred.

19. Post Construction Stormwater Management (PCSM). Defined in 25 PA Code Chapter 102. Management of stormwater associated with a project site after the earth disturbance activity has been completed and the project site is permanently stabilized. The term "post-construction" is used to differentiate PCSM from discharges during construction. Erosion and sediment pollution control (ESPC) plans are required for most construction projects to show that runoff from disturbed areas during construction is properly managed. PCSM deals with runoff from the project after the earth disturbance is completed and the site has been stabilized.

20. Post-development. Refers to runoff condition that exists onsite after the earth disturbance activity has been completed and the project site is permanently stabilized.

21. Reconstruction. Roadways that are rebuilt primarily along the existing alignment. Reconstruction normally involves full-depth pavement replacement. Other work that would fall into the category of reconstruction would be adding 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) or reconfiguring intersections and interchanges.

22. Riparian Buffer. A vegetated area that plays a key role in maintaining water quality and providing nutrients in associated streams, rivers and lakes, thus providing economic and environmental benefits. It is simply defined as "A BMP that is an area of permanent vegetation along surface waters," in 25 PA Code Chapter 102.

23. Riparian Forest Buffer. Defined in 25 PA Code Chapter 102. A type of riparian buffer that consists of permanent vegetation that is predominantly native trees, shrubs and forbs along surface waters that is maintained in a natural state or sustainably managed to protect and enhance water quality, stabilize stream channels and banks, and separate land use activities from surface waters.

24. Road Maintenance Activity (RMA). Earth disturbance activities within the existing road cross-section, as defined in 25 PA Code Chapter 102. Guidance on the types of work that meet the definition can be found in Publication 584, *PennDOT Drainage Manual*, Chapter 12, Appendix E.

25. Special Protection Waters. Antidegradation requirements in Pennsylvania provide protection to waterbodies in discrete levels or tiers based on their existing uses, level of water quality, and environmental characteristics. The standard level of protection given to all waterbodies is to protect and maintain their designated and existing uses. A special level of protection is afforded to waterbodies with High Quality and Exceptional Value existing or designated uses, which is to protect existing water quality. These waterbodies are often referred to as Special Protection Waters.

26. Stormwater Control Measure (SCM). A technique, measure, or structural control that is used for a given set of conditions to manage stormwater runoff quantity, minimize erosive conditions, and improve effluent quality in a cost-effective manner.

27. Surface Waters. Defined in 25 PA Code Chapter 102. Perennial and intermittent streams, rivers, lakes, reservoirs, ponds, wetlands, springs, natural seeps, and estuaries, excluding water at facilities approved for wastewater treatment such as wastewater treatment impoundments, cooling water ponds, and constructed wetlands used as part of a wastewater treatment process.

28. Thermal Impact. Defined in 25 PA Code Chapter 96. The threshold for a thermal impact to the water quality of a receiving surface water is more than two degrees Fahrenheit change during a one-hour period in mean water temperature. The water quality criteria do not preclude the allowance of a reasonable mixing zone if there is no significant effect on the ambient temperature of the stream outside the mixing zone.

29. Total Maximum Daily Load (TMDL). Defined by 25 PA Code Chapter 96. The sum of individual waste load allocations for point sources, load allocations for nonpoint sources and natural quality and a margin of safety expressed in terms of mass per time, toxicity or other appropriate measures. It is the amount of pollutant loading that a waterbody can assimilate and meet water quality standards. The TMDL process is a planning tool to develop pollution reduction goals that will improve impaired waters to meet water quality standards.

C. Design Standards and Calculations. A quantitative PCSM analysis is required whenever a project must obtain a permit under 25 PA Code Chapter 102 (herein referred to as Chapter 102) or it is within a watershed with an approved and current Act 167 Stormwater Management Plan (SMP). Three key measures are used to assess the potential for impacts from stormwater runoff – rate, volume, and quality. The goal of PCSM is to prevent or minimize any increase in the quantity (rate and volume) of runoff while also minimizing the factors affecting the quality. Commonly cited concerns related to potential effects of roadway runoff on water resources are:

- Stream channel erosion and flooding resulting from increases in runoff rate and volume.
- Water quality impacts to streams from particulates, floatables, hydrocarbons, and deicing materials.
- Thermal impact on streams from heat transfer, base flow reduction, and loss of riparian buffer vegetation.

The PCSM design standards for Department projects address these concerns and are consistent with Chapter 102, which states that PCSM for any project must maintain and protect existing water quality and existing and designated uses by maintaining the site hydrology and water quality, and erosive impacts of the conditions prior to initiation of any earth disturbance activities. Section 102.8.b of Chapter 102 states PCSM "shall be planned and conducted to the extent practicable" in accordance with these eight items:

- Preserve the integrity of stream channels and maintain and protect the physical, biological and chemical qualities of the receiving stream.
- Prevent an increase in the rate of stormwater runoff.
- Minimize any increase in stormwater runoff volume.
- Minimize impervious areas.
- Maximize the protection of existing drainage features and existing vegetation.

- Minimize land clearing and grading.
- Minimize soil compaction.
- Utilize other structural or nonstructural BMPs that prevent or minimize changes in stormwater runoff.

Each of these items should be considered throughout the planning and design stages. Guidelines on PCSM calculations and assumptions are as follows.

1. **Runoff Volume.** The net difference in runoff volume from pre- to post-construction conditions for the 2-year, 24-hour storm event should be managed for each point of interest, as defined in [Section 13.7.C.6](#). All non-structural SCMs should first be evaluated and applied to the extent practicable. Other SCMs utilizing infiltration, evapotranspiration, or managed (slow) release must then be evaluated for potential volume reduction "credits." Important cover condition assumptions are explained in [Section 13.7.C.4](#).
2. **Peak Rate of Runoff.** In the absence of an approved and current watershed-based Act 167 SMP, post-construction peak rates should be controlled to pre-construction peak rates for the 2-, 10-, 50- and 100-year, 24-hour storm events. The cumulative effect of the project on peak flows on the surface water hydrology will be the basis for determining the extent to which SCMs are needed to control rates. Peak rates should be evaluated at each point of interest. As noted in [Section 13.7.D](#), the release rate standards from an approved and current Act 167 SMP are applicable to any portion of a project located within that watershed.
3. **Water Quality.** The quantitative water quality goal for each surface water is to achieve no net change (i.e., increase) in pollutant loads for storms up to and including the 2-year/24-hour storm. DEP requires analysis of three pollutant constituents: Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN). The Pennsylvania Stormwater Best Management Practices Manual recognizes these three constituents as surrogates for other pollutants that occur in lesser concentration but can also impact water quality. Pollutant loads are calculated for pre- and post-construction conditions and SCMs are used to eliminate increases. DEP published new guidelines for water quality calculations in December 2019 with the reissuance of PAG-02. The guidelines include land cover pollutant concentrations and median outflow pollutant concentrations for various SCM types. Calculations must be demonstrated in the Quality Worksheet of PA DEP's PCSM Spreadsheet, which can be downloaded using the following link:
http://files.dep.state.pa.us/Water/BNPNSM/StormwaterManagement/ConstructionStormwater/DEP_PCSM_Spreadsheet.xlsb

Chapter 102 regulations also require an analysis of potential thermal impacts. While no quantitative analysis is required, a description of how thermal impacts were avoided, minimized, or mitigated must be provided. Strategies to reduce the potential for thermal impacts include:

- Limit the use of curb and gutter sections to the extent practicable.
- Utilize vegetated channels in lieu of storm sewer to the extent practicable.
- Consider vegetated islands in lieu of concrete islands.
- Maintain naturally occurring vegetation (i.e., buffer zones, including wetland and riparian) along streams, rivers and other surface waters for shading and thermal protection.

Although the use of vegetated swales for stormwater conveyance is preferred, storm sewers are buried and generally stay cool; thus, a significant amount of heat loss can take place in a long sewer run before the runoff reaches the surface water.

4. **Existing Cover Conditions.** The soil-cover complex is an important variable in calculating runoff quantities from a drainage area. Coarser textured soils will generally produce less runoff than finer textured soils. Undeveloped and densely vegetated land cover will produce lower runoff quantities compared to developed and sparsely vegetated land cover.

In Section 102.8(g)(2) of Chapter 102, criteria are given related to land cover assumptions for calculating pre-development runoff volume and water quality. New construction, which means new and relocated roadway projects shall apply these criteria, which are:

- 20% of disturbed impervious areas is computed as meadow cover in good condition.
- All non-forested disturbed pervious areas are computed as meadow cover in good condition.

In accordance with Chapter 102, these criteria shall not be applied to reconstruction and 3R projects (see Definitions in [Section 13.7.B](#)). DEP specifically exempts projects that are centered around the existing highway from these criteria by including the phrase, "except for repair, reconstruction or restoration of roadways or rail lines," with criteria above. Not to be confused with Chapter 102 *road maintenance activities*, which are altogether exempt from Chapter 102 permit requirements, these projects shall use the actual existing soil-cover complexes to compute pre-development runoff volumes, including for water quality.

Chapter 102 does allow for exceptions to the former assumption (related to existing impervious areas) if the "existing site contains impervious area and the existing site conditions have public health, safety or environmental limitations." To be exempted, it must be demonstrated that "it is not practicable to satisfy the requirement" and "the stormwater volume reduction and water quality treatment will be maximized to the extent practicable."

Actual existing cover conditions should always be used for peak rate calculations.

5. Discharge Point. Chapter 102 permits require identification of all "discharge points" during and post construction. A discharge point (DP) is equivalent to an MS4 outfall or observation point; the difference is that MS4 outfalls are limited to U.S. Census Urbanized Areas. A DP is herein defined as a location in which runoff from an area of earth disturbance does one of the following:

- Concentrates and drains into a surface water within the right-of-way.
- Discharges through a flow dispersion SCM (e.g., level spreader) prior to draining into a surface water within the right-of-way.
- Leaves the legal right-of-way via waters of the Commonwealth other than surface waters (e.g., human-made drainage ditches, natural ephemeral channels).
- Enters an MS4 that is not operated by the Department.

Pipes that discharge to a waterbody through a bridge abutment or wall of a culvert are DPs. Bridge scuppers are also DPs, but they can be counted as one instead of each individually. Each swale, ditch, or gutter should be mapped as separate DPs, even when they are near each other, such as around bridges. For example, if there are ditches that discharge to a stream in four quadrants of a bridge, each ditch outlet to the stream should be mapped as a DP. Per DEP's instructions, DPs must be identified and labeled sequentially on the plan using three numerical digits, starting with 001.

Sheet flow that originates as sheet flow from the land surface and drains directly into a surface water is not considered a DP. Culverts that convey a stream or other waterbody are not, by themselves, a DP. A daylighted pavement underdrain is also not to be counted as a DP.

6. Point of Analysis. A point of analysis (POA) is where stormwater quantity and quality are analyzed to demonstrate control and management in accordance with Section 102.8(g) of Chapter 102. A POA is located at the receiving surface water and may be within the right-of-way (onsite) or outside of the right-of-way (offsite). When it is located onsite, a POA is also a DP. The net stormwater volumes, peak rates, and pollutant loads resulting from roadway improvements and any proposed stormwater control measures are calculated at the POA.

A single POA is sufficient for watercourses with drainage areas of at least 1.0 mi². When runoff from the project area enters the watercourse at multiple locations, the POA is the point furthest downstream that receives runoff from the project site.

It may be appropriate to establish more than one POA for watercourses with drainage areas less than 1.0 mi². A "10% rule" may be used as a starting point. If the project site area is less than 10% of the watercourse's drainage area, a single POA will normally be adequate. Otherwise, multiple POAs may be more appropriate, and the project area to any POA should generally not exceed 10% of the watercourse's drainage area.

A POA is also established for each lake, pond, and wetland receiving runoff from earth disturbance areas of the project. A wetland that is regularly flooded by an adjacent watercourse does not require its own POA.

Regardless of the numerical runoff standards being applied or where the POA is located, the integrity of stream channels must be preserved, and the physical, biological and chemical qualities of the receiving stream must be maintained and protected. The key is looking at post-construction stormwater runoff quantities, locations, and characteristics, coupled with the size, sensitivity, and orientation of receiving surface waters. The analysis should allow the designer to draw conclusions about the effects that stormwater discharges from the project site will have on receiving surface waters or discharges from the right-of-way.

Significant changes in drainage area characteristics to a DP contributing to an offsite POA may indicate the need for further evaluation at the DP. For example, if the proposed peak flow rate to an ephemeral stream is significantly higher compared to the existing condition, an evaluation of the stability of the channel and potential effects of spillover into properties adjacent to the channel downstream may be warranted. The channel pathway below the DP to the nearest stable outflow should be evaluated for accelerated erosion during a 10-year, 24-hour storm event. In cases where an increase is necessary and it causes a significant encroachment onto private property, the Department may wish to obtain an express easement from the property owner for the affected areas.

D. Act 167 SMPs and Municipal Ordinances. State highway projects must be designed in accordance with the standards of Act 167 SMPs that are current and approved by PA DEP. These SMPs are normally developed at the county level and then are reviewed and approved by PA DEP. Municipalities within the boundaries of the watershed(s) in the SMP subsequently adopt stormwater ordinances based on the model stormwater ordinance in the SMP. The Department is not required to comply with local stormwater ordinances, including ordinances adopted under an Act 167 SMP. Consistency only with the SMP approved by PA DEP is required. Additionally, since Act 167 requires that SMPs be periodically reviewed and revised at least every five years, consistency with the SMP is only required if it has been revised in accordance with the Act. However, the Department strives to maintain good relations with local municipalities and, on a case-by-case basis, will incorporate provisions in local ordinances when feasible and practicable. Municipal stormwater ordinances should be used to design SCMs on a project only when directed by the Department.

If consistency with an approved and current Act 167 SMP is not practicable, the design standards in [Section 13.7.C](#) shall be applied, and the SMP should be followed to the extent practicable.

PA DEP's eMapPA website is useful for determining if all or a portion of a project is within a watershed or county with an approved Act 167 SMP. The most current information for approved Act 167 SMPs is provided through PA DEP's website: <https://www.dep.pa.gov/Business/Water/CleanWater/StormwaterMgmt/Pages/Act-167.aspx>.

E. Special Protection Surface Water Discharge Analysis. For portions of projects that discharge to special protection surface waters (HQ, EV), failure to eliminate the net change in runoff volume or rate for the 2-year, 24-hour storm will require the use of ABACT BMPs as part of the Chapter 102 permit. To satisfy the special protection surface water discharge requirements, non-discharge alternatives must be implemented to the extent practicable if they exist. If non-discharge alternatives do not exist, then the net change must be managed using ABACT BMPs. ABACT is defined in [Section 13.7.B](#). The analysis should also affirm that the chosen ABACT BMPs fully manage the net change. The analysis is summarized in the Chapter 102 permit.

F. Impaired Surface Waters. PA DEP has an ongoing program to assess the quality of surface waters in Pennsylvania, identify those that are not attaining designated and existing uses, and designate those non-attaining surface waters as "impaired." Assessments are performed for four protected uses of surface waters: aquatic life, potable water, recreation, and fish consumption. For example, the assessment of the aquatic life use is a measure of the health of the aquatic communities such as benthic macroinvertebrates (insects, worms, crustaceans) and fish. An impaired waterbody with respect to aquatic life use means that the overall aquatic community (fish, macroinvertebrates, plants, and algae) is not healthy and there are pollutants or pollution that needs to be minimized

or eliminated to return the waterbody to a healthy condition. Reasons for an impairment may be one or more point sources, like industrial or sewage discharges, or non-point sources, like abandoned mine lands, agricultural runoff, or urban runoff. Examples of the pollutants that can cause impairment are metals, pH, mercury or siltation.

To the extent practicable, when a project is within an impaired watershed, the stormwater design should reduce the sources and pollutant loads that potentially contribute to the impairment. Chapter 102 permits require evaluation of non-discharge alternatives (see definitions) for discharges to surface waters impaired for siltation, suspended solids, turbidity, water/flow variability, flow modifications/alterations, or nutrients. If non-discharge alternatives do not exist, the net change must be managed using ABACT BMPs.

G. Municipal Separate Storm Sewer Systems (MS4). The Department is required to obtain an NPDES permit as a state entity that designs, builds and maintains stormwater conveyance systems in support of transportation systems. The regulated features are Municipal Separate Storm Sewer Systems (MS4s) within U.S. Census urbanized areas that discharge to waters of the U.S. The Department's MS4 covers "conveyance systems owned and/or operated by PennDOT which are designated or used for collecting or conveying stormwater associated with PennDOT roads, highways, bridges and related structures." This includes SCMs which are legally considered appurtenances to PennDOT's conveyance or drainage systems and vehicle maintenance and operation facilities (e.g., stockpiles, county maintenance facilities, etc.). Activities involving MS4 should be coordinated with BOMO.

H. Riparian Buffers. PennDOT projects frequently involve stream crossings that result in earth disturbance within riparian buffers. Chapter 102 includes regulatory requirements for riparian buffers. Act 162 of 2014 amended the Pennsylvania Clean Streams Law to establish methods that can be used to meet riparian buffer requirements for NPDES permits (not all Chapter 102 permits). When read together, Chapter 102 and Act 162 provide the regulatory framework for riparian buffer requirements associated with NPDES permits.

The scope of projects subject to the riparian buffer regulatory requirements of Act 162 and Chapter 102 is relatively limited. The underlying Chapter 102 requirements related to riparian buffers are mandatory only for projects that discharge to surface waters with an HQ or EV designated use. Therefore, riparian buffer requirements only apply to projects requiring an Individual NPDES Permit with earth disturbance activities within 150 feet of a river, stream, creek, lake, pond, or reservoir with an HQ or EV designated use. Other Chapter 102 permits are not covered by Act 162.

PA DEP's published guidance on riparian buffer equivalency and offsetting and the Department's Publication 783, *Environmental Permitting Handbook*, contain useful information on determining applicability and designing the necessary SCMs to satisfy the regulations.

I. Stormwater Control Measures. A stormwater control measure (SCM) is a technique, measure, or structural control that is used for a given set of conditions to manage the quantity and improve the quality of stormwater runoff in a cost-effective manner. In the past, these were often referred to as stormwater best management practices (BMPs). Project-specific conditions and limitations will often dictate the type, number, and size of SCMs that are proposed to manage stormwater for a given project. Detailed information regarding the design, siting, risk considerations, and maintenance of SCMs is contained in Chapter 14 of Publication 584, *PennDOT Drainage Manual*, and Publication 888, *Stormwater Control Measures Maintenance Manual*.

1. Approved SCMs. The following list includes SCMs that are approved for use on PennDOT projects.

Non-Structural SCMs

- Minimize Compaction
- Preserve Trees and Re-vegetate Using Native Species
- Impervious Disconnection
- Slope Roughening

Restoration SCMs

- Riparian Buffer Restoration
- Landscaping and Planting
- Soil Amendment Restoration
- Stream Restoration and Stabilization

Structural SCMs

- Vegetated Swale
- Bioretention
- Vegetated Filter Strip
- Media Filter Drain
- Subsurface Infiltration Trench
- Infiltration Detention Basin
- Infiltration Berm
- Wet Detention Basin
- Stormwater Wetland
- Dry Detention Basin
- Dry Ultra-Extended Detention Basin
- Level Spreader and Flow Dispersion
- Regenerative Step Pool

2. SCMs Requiring Special Approval. These SCMs cannot be proposed for implementation within Department right-of-way without prior approval from the District Stormwater Maintenance Coordinator.

- Street Sweeping (non-structural)
- Permeable Pavement
- Constructed Stormwater Filter
- Manufactured Treatment Devices
- Subsurface Detention Storage

J. Soil Profile and Infiltration Testing. One of the primary PCSM objectives is to manage the net change in runoff volume from pre- to post-construction conditions. Meeting this objective requires a thorough evaluation of the project site for opportunities to include infiltration SCMs. A preliminary site evaluation for infiltration capabilities must be conducted early in the design process to identify areas suitable or unsuitable for infiltration SCMs. Such an evaluation should be conducted by a professional(s) experienced in soil classification, geology, and the design of infiltration SCMs. Appropriate steps are as follows.

1. Evaluate Existing Features.

- a. Perform an initial desktop investigation documenting existing conditions at the site (e.g., soil types, karst, surface waters).
- b. Review the proposed plan improvements (e.g., locations of cut/fill, utilities, new pavement).
- c. Identify potential infiltration SCM locations and testing locations and conduct a site visit that includes surface and shallow depth field observation.

2. Preliminary Testing.

- a.** Perform at least one infiltration test for every 40,000 ft² outside of the roadway cross-section and within the project site boundary (minimum of 4 tests).
- b.** Collect soil profile data or a soil characterization test pit/bore hole within 100 ft of all infiltration tests to demonstrate that testing was performed in infiltration-conductive soil horizons.

When infiltration is not feasible, it is incumbent on the PCSM Plan preparer to demonstrate that environmental or public safety limitations exist that preclude the use of infiltration SCMs.

If potential areas have been identified, a preliminary plan shall be developed including location(s) and type(s) of the proposed infiltration SCM(s), bottom elevations and a preliminary grading design. Those areas must then be explored to find infiltration SCM design saturated hydraulic conductivity rates.

Section 14.19 of Publication 584, *PennDOT Drainage Manual*, contains additional information regarding procedures for soil characterization and infiltration testing.

K. SCM Inventory Data. The Bureau of Maintenance and Operation (BOMO) maintains an inventory of Department owned SCMs. The data in this inventory serves as the basis of the Department's SCM maintenance program. The inventory contains numerous data fields for each SCM that provides information on an SCM's type, location, age, treatment capabilities, and inspection needs. Any new SCMs designed for a Department project must be added to the inventory to ensure the SCM is properly tracked, inspected, and maintained. The PCSM Plan designer is responsible for submitting new SCM data with the PCSM Plan. The procedure is as follows.

- 1.** PCSM Plan designer completes the SCM inventory spreadsheet in conjunction with the PCSM Plan submission in Final Design.
- 2.** Upon approval of the Chapter 102 permit Notice of Termination, the District Stormwater Maintenance Coordinator (or designee) updates the SCM inventory spreadsheet as necessary to reflect any changes to the design during construction.
- 3.** BOMO reviews the final data and assigns an SCM identification code to begin the post-construction phase of SCM tracking, inspection and maintenance.

L. PCSM Plan. A PCSM Plan is required for all Department projects that require a Chapter 102 permit and SCMs are implemented. In accordance with Publication 14M, Design Manual Part 3, *Plans Presentation*, Chapter 6, the PCSM Plan shall be handled as an "Also Included" Plan. Note that on projects that do not require a Chapter 102 permit, any information for SCMs included in the project may be incorporated into the Construction Plan - a separate PCSM Plan is not required. All standards for PCSM Plan drawings are contained in Publication 14M, Design Manual Part 3, *Plans Presentation*, Chapters 6 and 15. These standards are based upon the requirements in Chapter 102. Each PCSM Plan must be accompanied by supporting calculations.

M. PCSM on Non-Chapter 102 Permit Projects. A PCSM analysis involving quantitative runoff calculations and SCM design is typically only required for projects with a Chapter 102 permit or Act 167 SMP requirements. However, other PA DEP permits also require compliance with Chapter 102. Specifically, this section addresses PCSM requirements for a project that meets the following criteria:

- Less than 25 acres of Road Maintenance Activity (RMA) - no E&S Permit (102.5.b)
- Less than 1 acre of non-RMA earth disturbance - no NPDES permit (102.5.a)
- Includes earth disturbance that is not RMA
- Requires a 25 Pa Code Chapter 105 (Water Obstruction and Encroachment) permit

Section 102.8 in Chapter 102 describes the requirements for PCSM. It states new PA DEP permits that require compliance with Chapter 102 must develop a written PCSM Plan. All Chapter 105 permits require compliance with Chapter 102, as they must have a written ESPC Plan (Section 105.13.g). Chapter 102 RMAs, however, do not require compliance with Section 102.8, even if a Chapter 105 permit is required; the non-RMA areas must comply.

Examples of projects that typically meet the criteria described above include:

- Rehabilitation or replacement of stream crossings
- Slide repair adjacent to a surface water
- Safety improvements that encroach upon a floodway or floodplain or impact wetlands

A common characteristic of these types of projects is that they have a negligible change in stormwater runoff. Therefore, SCMs are often not necessary to achieve compliance with Chapter 102. The requirements can be satisfied by including a narrative in the report for the ESPC Plan that describes how the items in Section 102.8.b of Chapter 102 have been considered. Each surface water that receives runoff from the project should be addressed separately. Additional guidance on satisfying Chapter 102 requirements related to PCSM for these types of projects can be found in Chapter 14 of Publication 584, *PennDOT Drainage Manual*.

N. Off-site Discharges. Some areas within the limits of earth disturbance of a project may not have direct access to surface waters to discharge stormwater runoff. Off-site stormwater discharges are those that do not reach a surface water prior to leaving the legal right-of-way. The Department is expected to secure an easement (e.g., common law or express) providing legal authority for the off-site discharge, unless waived by the property owner. When construction activities will not result in a change in volume or peak rate of stormwater runoff (for all storm events) to existing swales, ditches, storm sewers or similar structures, the existing common law easement can be relied upon.

An express easement should be evaluated when there will be a change in volume or rate of stormwater (for all storm events). The Department is not required to provide or identify its legal right to discharge stormwater in order to obtain a Chapter 102 permit.

The Department must evaluate the effect construction and post-construction stormwater discharges may have on accelerated erosion to down slope or adjacent properties, regardless of whether there are increases in the volume or peak rate of stormwater discharges from a project site. Documentation must be provided that demonstrates that the discharge will not cause accelerated erosion on the properties along the flow path to a surface water.

The following information must be provided with the permit:

- On the ESPC Plan and PCSM Plan drawings, identify all properties and property owners that will or may receive off-site stormwater discharges from the project site until discharges reach surface waters.
- On the ESPC Plan and PCSM Plan drawings, identify the flow path from discharge point to the confluence with a surface water. In addition, identify the soil types, erodibility factors and vegetative cover of the flow path.
- In the written narrative portion of the ESPC Plan and PCSM Plan, provide an analysis that demonstrates that the proposed volume and peak rate of stormwater discharging to the flow path will avoid, minimize, or mitigate accelerated erosion or sedimentation for storm events up to and including the 10-year/24-hour storm.

If stormwater discharges will enter a municipal separate storm sewer system (MS4) or a combined sewer system with combined sewer overflows (CSOs), and there will be an increase in runoff volume or peak rate, the Department must provide written consent from the MS4 or CSO permittee before a Chapter 102 permit can be issued.

CHAPTER 14

COST ESTIMATING

14.0 INTRODUCTION

Cost Estimates that are to be provided by design agencies as part of the Preliminary Engineering Report are to be set up in accordance with the following format. The cost estimate for final design shall be the standard Form 407.

The procedures used in the preparation of the cost estimate are as follows:

1. Individual estimates are to be provided for each anticipated construction section. These shall also be combined into a total estimate.
2. Unit prices and an explanation of their basis are to be included as a separate item in the report.
3. All back-up data used to develop unit prices and Form D-405, Work Sheet for Cost Estimate, are to be supplied to the District, but not as a part of the Study Report.
4. It is expected that the estimate be developed from the best available information such as models using computerized historical bid data. For example, a cost per kilometer for guide rail may be used in a Preliminary Engineering Report while a specific breakdown of items shall appear in the Form 407.
5. The cost estimate format is a guide and it may have to be modified for special cases.
6. The cost estimate should be based on the anticipated letting date of the project.

Related material can be located in Publication 352, *Estimating Manual*.

COST ESTIMATE

_____ County Sta _____ To Sta _____
 SR _____ Section _____ Length _____

Project Description: _____

- | | | |
|-----|--|-------|
| 1. | Pavement, Base and Shoulder | _____ |
| 2. | Grading and Drainage | _____ |
| | (a) Grading | _____ |
| | (b) Drainage and Minor Structures | _____ |
| 3. | Grade Separation Structures | _____ |
| | (a) Location | _____ |
| | (b) | _____ |
| | (c) | _____ |
| 4. | Interchanges | _____ |
| | (a) Location | _____ |
| | (b) | _____ |
| | (c) | _____ |
| 5. | Other Bridges and Tunnels | _____ |
| | (a) Location | _____ |
| | (b) | _____ |
| | (c) | _____ |
| 6. | Retaining Walls | _____ |
| 7. | Highway Hardware (Guide Rail, Median
Barrier, Right-of-Way Fence, Signing,
Lighting, etc.) | _____ |
| 8. | Frontage Roads and Service Roads | _____ |
| | (a) Location | _____ |
| | (b) | _____ |
| | (c) | _____ |
| 9. | Environmental Considerations | _____ |
| | (a) Erosion Control | _____ |
| | (b) Landscaping | _____ |
| | (c) Safety Rest Areas | _____ |
| | (d) Protection of 4(f) Lands | _____ |
| | (e) Etc. | _____ |
| 10. | Mobilization | _____ |
| 11. | Maintenance and Protection of Traffic | _____ |

SUBTOTAL

- | | | |
|-----|--|-------|
| 12. | Contingencies (Normally 10% of
Lines 1 to 10) | _____ |
|-----|--|-------|

SUBTOTAL (Total Construction Cost)

- | | | |
|-----|--|-------|
| 13. | Right-of-Way (Acquisition, Relocation
and Demolition) | _____ |
| 14. | Utilities | _____ |
| 15. | Engineering | _____ |

TOTAL PROJECT COST _____

D-405

WORK SHEET FOR COST
ESTIMATE

COMPILED BY: _____

DATE: _____

COUNTY	S.R. & SEC.	F.A.I. RTE.	STATION	TO STATION	LENGTH
--------	-------------	-------------	---------	------------	--------

PROJECT DESCRIPTION:

ITEM	UNIT	QUANTITY	UNIT COST	SUB-TOTAL	TOTAL \$1,000
1. BASE: SURFACING: SHOULDERS					
A. _____ PAVEMENT					
B. SUB-BASE					
C. PAVED SHOULDERS					
D. SHOULDERS					
E. SUBGRADE					
F. MEDIAN PAVEMENT					
G. SIDEWALK					
H.					
				TOTAL	
2. A GRADING					
(1) EXCAVATION					
(2) BORROW					
(3) CLEARING & GRUBBING					
B DRAINAGE & MINOR STRUCTURES					
				TOTAL	
3 GRADE SEPARATIONS (WITHOUT RAMPS)					
TYPE _____					
A. STRUCTURE					
B. CROSSROAD ADJUSTMENTS (INCLUDES ALL COSTS INCIDENT TO CHANGES IN CROSSROADS)					
C.					
				TOTAL	
4 INTERCHANGE: COMPLETE*					
(*) DO NOT INCLUDE ANY MAIN LINE QUANTITIES					
A. PAVEMENT					
B. SUB-BASE					
C. SHOULDERS					
D. EXCAVATION					
E. BORROW					
F. STRUCTURES					
G. DRAINAGE					
H. SLOPE TREATMENT					
I. ROADSIDE IMPROVEMENT					
J. CROSSROAD ADJUSTMENT					
K. GUARD RAIL					
L. MEDIAN BARRIER					
M. R/W FENCE					
N. CURBS					
O. SUBGRADE					
P. LIGHTING					
Q. SIGNING					
R. TRAFFIC CONTROL DEVICES					
S.					
				TOTAL	
5 OTHER BRIDGES: TUNNELS					
TYPE _____					
A.					
B.					
C.					
D.					
				TOTAL	
6 WALLS					
A.					
B.					
C.					
				TOTAL	
7 HIGHWAY HARDWARE (MAIN LINE ONLY)					
A. GUARDRAIL: COMPLETE					
B. LIGHTING					
C. SIGNS					
D. R/W FENCE (TYPE _____)					
E. TRAFFIC CONTROL DEVICES					
F. MEDIAN BARRIER					
				TOTAL	
8 FRONTAGE ROADS & SERVICE ROADS					
A.					
B.					
C.					
				TOTAL	
9 ENVIRONMENTAL CONSIDERATIONS					
A. EROSION CONTROL					
B. LANDSCAPING					
C. REST AREAS					
D. SCENIC OVERLOOKS					
E. TEMPORARY WATER POLLUTION CONTROL					
F.					
				TOTAL	
10 MOBILIZATION				TOTAL	
11 MAINTENANCE & PROTECTION OF TRAFFIC				TOTAL	
SUB-TOTAL, ITEMS 1 TO 11 INCLUSIVE					
12 CONTINGENCIES (10% OF ITEM 1 TO 11)				TOTAL	
SUB-TOTAL (TOTAL CONSTRUCTION COSTS)					
13 RIGHT OF WAY					
A. LAND ACQUISITION					
B. RELOCATION PAYMENTS					
C. DEMOLITION					
				TOTAL	
14 UTILITY ADJUSTMENTS					
15 ENGINEERING					
TOTAL ESTIMATED COST					

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CHAPTER 15

RESERVED FOR FUTURE USE

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CHAPTER 16

BICYCLE FACILITIES

Refer to Publication 13, Design Manual Part 2, *Contextual Roadway Design*, Chapter 14, Bicycle Facilities.

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CHAPTER 17

EMERGENCY ESCAPE RAMPS

Refer to Publication 13, Design Manual Part 2, *Contextual Roadway Design*, Chapter 23, Emergency Escape Ramps.

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CHAPTER 18

TEMPORARY ROADS AND BRIDGES

Refer to Publication 13, Design Manual Part 2, *Contextual Roadway Design*, except for the following sections:

18.1 DEFINITIONS

For the purpose of these guidelines, the following definitions apply:

1. Temporary Stream Crossing. A temporary crossing of a stream with multiple pipes, pipe arches or similar conduits covered with fill material.
2. Temporary Bridge. A temporary crossing of a stream or other topographic feature consisting of a bridge superstructure with an appropriate substructure.
3. Temporary Road. A temporary roadway forming the approaches to a temporary stream crossing or temporary bridge.

18.5 WATERWAY OPENING - PA DEP PERMIT

The application for the Pennsylvania Department of Environmental Protection's (PA DEP) Waterway Obstruction Permit must include the proposed waterway opening for the temporary bridge or crossing. This required waterway opening is to be designed so that the temporary condition will not cause any significant damage by flooding adjacent property.

A. Temporary Stream Crossing (Pipes). The minimum flood that can be used is for the 2.33-year design storm ($Q_{2.33}$). A greater recurrence interval (such as the 10-year design storm (Q_{10})) shall be used if warranted by site conditions and engineering analysis.

B. Temporary Bridge. Refer to Publication 15M, Design Manual, Part 4, *Structures*, Volume 1, Part A, Chapter 5 for guidelines to size the waterway opening.

CHAPTER 19

CONSIDERATIONS FOR ALTERNATIVE TRANSPORTATION MODES

Refer to Publication 13, Design Manual Part 2, *Contextual Roadway Design*.

CHAPTER 20

WILDLIFE CROSSINGS

Refer to Publication 13, Design Manual Part 2, *Contextual Roadway Design*, Chapter 21, Wildlife Crossings.

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