

## **ADA CURB RAMP DESIGN GUIDANCE**

### **FOREWORD**

*The Pennsylvania Department of Transportation, Engineering District 6-0 has produced this document to serve as a design tool to provide guidance to contractors, engineers and all those involved with the design and construction of Americans with Disabilities (ADA) compliant curb ramps. It is our intent to present this guidance so that you have the tools needed to expedite ramp design approval. We have worked with many partners in the development of this document including the City of Philadelphia, PENNDOT Central Office, and representatives from the design consultant community to include the most current level of knowledge and practical experience. This is not a set of exact instructions nor is it to be taken as official Department “policy” but rather it is to be used as a guide that reflects District 6-0’s expectations and internal practices so that designs can be approved to ensure contractor project needs are met. Official Policy comes only from PENNDOT’s central office. This Document does not super-cede nor in any way invalidate any ADA standards, policies or laws that are applicable on both the State and Federal levels. It is our goal that this document will help all stakeholders with this very challenging issue by improving overall understanding of the ADA design-review process.*

### **I- General**

A Design Drawing must be prepared and submitted for the proposed curb ramps in accordance with Standard Drawing RC-67M, the Department’s Design Manual Part 2, Chapter 6 and/or specific project details for review and approval.

#### **Design Specifications:**

Use PENNDOT Design Manual Part 2, Chapter 6 for design policy and procedures and design criteria. Use Standard Drawings RC-67M for additional information. In the event that certain design parameters are in conflict, the following order of predominance governs:

- All active Strike-off-Letters
- PennDOT Design Manual Part 2, Chapter 6 and Chapter 7
- Standard Drawing RC-67M (June 1, 2010)
- PennDOT Publication 72M, Roadway Construction Standards

- Publication 408, PennDOT Specifications
- Publication 149, Traffic Signal Design Handbook (Chapter 19)
- Code of Federal Regulations, 28 CFR part 36 (ADAAG)

## **II- Submission Requirements**

1- Fully complete the CS-4401 inspection forms to show the design parameters for each proposed curb ramp. The forms must note the location where the ramps are proposed to be installed and include photos of the existing facility. Additional comments explaining the parameters of the design can be attached as needed. Submit four (4) color hard copies of the CS-4401 forms with the design drawing details to the District ADA Coordinator for review and approval. Once the design and the forms are deemed acceptable, the electronic Excel version of the forms must be submitted for the District's records. Please note that for the City of Philadelphia projects, four (4) color hard copies of the CS-4401 forms with the design drawing details must be submitted; two (2) copies to the City and two (2) copies to the District for review and approval.

In addition, the following information must be included to clarify the scope and layout of the intersection in order to expedite the reviewing process:

- Project Type Identification
- Scope of Work
- Pertinent plans\* to include but not limited to: Traffic signal permit plans, pavement marking plans, construction plans, etc.

\*Please note that traffic signal permit plans and pavement marking plans need to be updated due to the installation of curb ramps.

2- The submission must include a transmittal letter clearly indicating the names of the Contractor, the Designer and the District's Resident Engineer. All submission transmittals must be directed to the ADE of Construction (transmittal letter only) and carbon copies distributed to the District's Resident Engineer (transmittal letter only), and ADA Coordinator (Transmittal letter plus pertinent design documents).

3- Three sheets of detail drawings for each intersection must be included with the submission. The Detail drawings must include three sheets as follows:

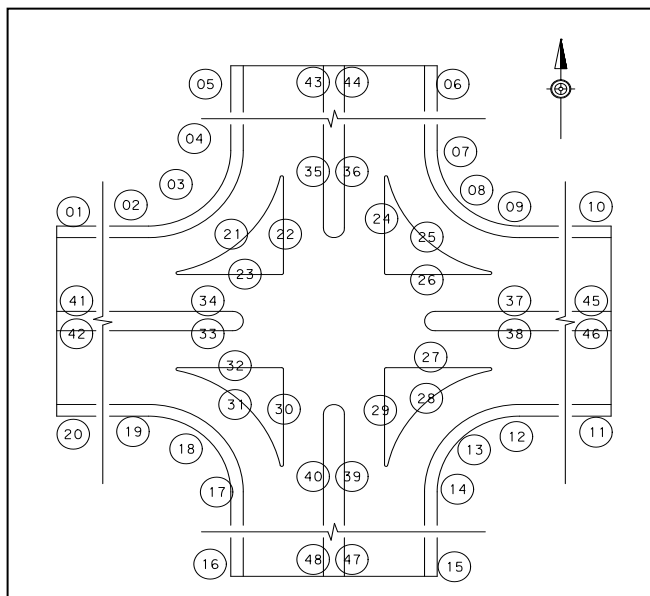
- i. A sheet with the overall intersection geometry information such as intersection layout, curb ramp alignment, pedestrian crosswalks, existing utilities, right-of-way lines, pavement edge and type, existing features (buildings, entryways, steps, walls, trees, shrubs/hedges) and traffic control devices (traffic signal poles, equipment, stop signs). (Please note

that intersection sight distances and the pedestrian traffic signal head cone vision should be taken into consideration when placing the ADA curb ramps).

- ii. A sheet with all pertinent elevations, and
- iii. A sheet with all the Curb Ramp Details.

4- The Design drawing details must be and include the following:

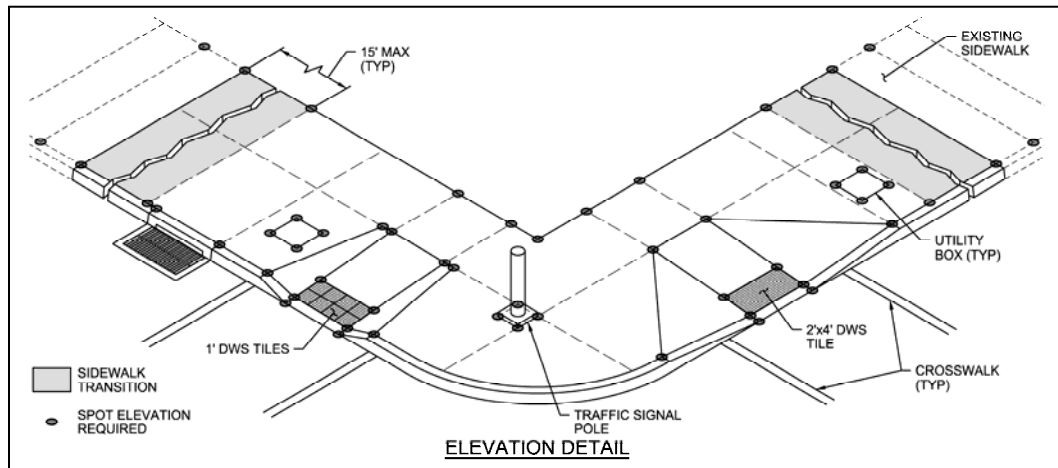
- a. Drawn to scale at a minimum of 1.0 inch per 10.0 feet, on 11" x 17" sheets of paper, each one depicting an entire intersection if possible, with all applicable ramps and enough detail to illustrate any impediments to providing ramps fully compliant with RC-67M. The design and drawings must be completed in English units. All drawing details must be legible.
- b. Depict a NORTH arrow on the drawings identifying the direction of magnetic North.
- c. A title block must appear in the lower right hand corner including the Project name and log No., ECMS number, HOP application number, date of submittal, a block for date of resubmittal(s), the name of the designer and firm along with the appropriate sheet number(s).
- d. Depict the type of curb ramp proposed. The ramp location number shall be labeled strictly based on ramp location figure from the CS4401 form (shown below).



- e. The right-of-way lines must be clearly identified on the drawings.

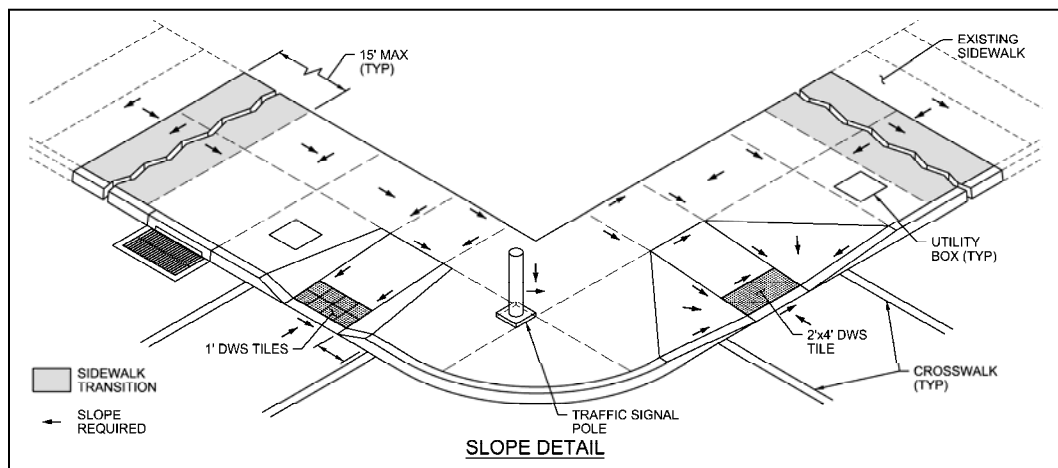
- f. Depict the existing and proposed vertical elevations of the finished grade of roadway directly at the corners of the proposed ramp and transition ends (designated to the nearest 0.01 foot.) as shown in the following schematic.

Example 1: Location of required spot elevations



- g. Depict the existing and proposed longitudinal and cross slopes of the roadway directly in front of and at the center of the proposed curb ramp (designated to the nearest 0.010 %.).
- h. Depict proposed running and cross slope percent of the ramp (designated to the nearest 0.010 %.).
- i. Depict existing and proposed running slopes of the sidewalk transitions to the ramp and or landing (designated to the nearest 0.010 %.).
- j. Depict running and cross-slopes of the existing sidewalk adjacent to the sidewalk transitions.

Example 2: Location of required slopes



- k. Depict the longitudinal slope along the DWS or transition strip.
  - l. Depict limits of removal of existing sidewalk (designated to the nearest 0.010 foot.).
  - m. Depict proposed length and width of the ramp.
  - n. Depict proposed horizontal location of the landing area.
  - o. Depict proposed slopes of the landing area (designated to the nearest 0.010 %.)
  - p. Depict proposed slopes of flares (designated to the nearest 0.010 %.)
  - q. If large triangular areas are proposed, depict the lateral slope of the flare between the sidewalk and the bottom of the DWS.
  - r. Depict proposed horizontal measurement(s) of flares (designated to the nearest 0.010 foot.).
  - s. Depict the proposed horizontal placement of DWS.
  - t. Depict horizontal and vertical relationships to the pedestrian push buttons (designated to the nearest 0.010 foot.).
  - u. Depict proposed/existing crosswalk line striping on the plans and the horizontal relationship (4 foot minimum) of the proposed crosswalk and stop bars (designated to the nearest 0.010 foot.).
  - v. Depict any utility features within the curb ramp construction area. Clearly show and call out the adjustment treatment for all utilities within the limits of work.
  - w. Depict all pertinent slopes on the plans, including existing and proposed conditions.
  - x. Depict all longitudinal slopes and cross slopes for the adjacent street in front of the curb ramps (gutter), the proposed curb ramps and landings.
  - y. Provide positive drainage; avoid potential drainage issues (no ponding of water is allowed.)
  - z. Depict existing and proposed right-of-way and construction easements.
  - aa. Depict all proposed cheek walls (including the max. reveal) or proposed grading.
- 5- A "Technically Infeasible Form" (TIF) must be fully completed (sheets 1 and 2) for each curb ramp when a design value(s) is not compliant with the Department's regulations. The TIF must include sufficient justification to clarify why the proposed design is the best alternative (color photos are also required). The TIF should evaluate at least three alternatives and a summary must be provided. Submit four (4) color hard copies of the TIF form with the design drawing details to the District ADA Coordinator for review and approval.
- 6- The CS-4401 Inspection form must be fully completed including the name of the person that field viewed the site (designer), the ramp location in the diagram, photos and additional tabs to include further justification/explanation

for the proposed design. Please make sure that all appropriate cells are completed and include photos depicting the proposed ramp location from different angles. The photos should be close enough that details for design can be seen and evaluated. A sample of the inspection form is attached. Please contact the ADA reviewing staff to obtain an electronic copy of this form.

### **III- SUBMISSION AND REVIEWING PROCESS**

#### **DESIGN**

- 1- Four (4) paper color copies of the TIF's, inspection forms and detail drawings are required for review. These documents must be included in a binder to facilitate review and record keeping; a minimum of four (4) binder sets are required. Two sets will be kept for our files, one set will be returned to the contractor, and the other set will be sent to the inspector as a "field book copy" (Copies of the signed TIF's will be included). The design drawings must be sealed by a Professional Engineer registered in the Commonwealth of Pennsylvania.
- 2- The maximum number of intersections that can be included in a binder set is 6 intersections (48 curb ramps approximately). Please note that in some cases, the separation of intersections may allow portions of a project to be advanced; while the remaining binders review is completed.
- 3- The submission will be "logged into" at the Districts ADA Database and an ADA job number will be assigned for the submission. The ADA job number must be used when referencing the submission in any correspondence.
- 4- Electronic submissions will not be reviewed. (Curb ramp designs may be discussed and commented on via e-mail or phone conversations but approvals will not be issued until a formal review is completed). Please note that the design drawing details must be prepared using AutoCAD or Microstation; hand drawn details will not be approved.
- 5- The District will issue an e-mail describing stating that the curb ramp design has been approved and it is acceptable for construction. Signed TIF's will also indicate that the curb ramp design has been approved. The curb ramp design is not acceptable for construction unless a written document is provided by the district; this document (e-mail or/ signed TIF's forms) will clearly indicate that the curb ramp design has been approved and it is acceptable for construction. Approvals will always be issued via

- an e-mail or signed TIF's (Verbal discussions do not indicate design approval).
- 6- Once the curb ramp design is approved, field books will be prepared and released to the resident engineer and the Contractor. All approved field books will include a copy of the signed TIF's. For City of Philadelphia projects the field book will be released to the City.

***Note: Before the field book is released for construction, the designer must submit a CD with all the pertinent information that was approved including detail drawings in PDF format, and the TIF's and inspection forms in Excel Format.***

### CONSTRUCTION

- 1- The designer must be contacted and all construction work must be stopped if unforeseen physical limitations are found in the field. The designer must evaluate if the approved ADA curb ramp design needs to be revised and/or modified due to such limitations/constraints. The District's construction ADA inspector may be consulted to evaluate/discuss alternative designs with the designer in order to resolve issues found in the field. Revisions of the inspection forms and TIF's may be necessary as a result of the field changes.
- 2- Field changes that do not result in non-compliance may be approved in the field by the resident engineer or ADA construction inspector. Any field changes that improve a non-compliant feature even if it remains non-compliant may be approved in the field.
- 3- Any & all other changes must be approved by the District's ADA coordinator per the process above.
- 4- The revised drawing details, inspection forms and TIF's must be submitted to the District's ADA Coordinator for final approval and TIF signatures. This process is intended to have a quick turn around and may be submitted electronically. Please note that all submissions must follow the process established in section II and III of this document.
- 5- The contractor and the resident engineer/inspector must jointly complete the as-built inspection forms.

## **IV - ADA DISTRICT 6-0 SPECIFIC GUIDANCE**

### **General**

- 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 Services or delegate and placed in the project design document file.
- If review comments are issued, the designer is responsible to provide a response to comments letter to expedite subsequent reviews.
- All pertinent slopes must be shown on the plans, including existing and proposed conditions.
- The Algebraic Grade Difference cannot exceed 11.0 % between any two surfaces, such as the road and the proposed curb ramp. If this requirement is not feasible; the curb ramp must be redesigned, relocated or removed. It is generally recommended that a design value slightly lower than 11% be utilized to allow for construction tolerance.
- Adequate visibility is required to ensure safe pedestrian movement. An intersection 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 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.
- The location of the curb ramps must be within the pedestrian traffic signal head cone of vision (See section 8 of Publication 149, traffic signal design handbook for further detail).
- A pedestrian study is required when completing work at signalized intersections without crosswalks. A pedestrian study (PED Accommodation checklist or Ped Study Determination Form) is also required to justify the removal of a crosswalk. A Bike/ PED checklist may need to be completed for complicated situations (See Pedestrian Accommodation at Signalized Intersections Checklist from PUB 149 – Chapter 19).



- 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.
- Vertical drops or lips located within the Pedestrian Access Route (PAR) may cause a pedestrian to trip or deny access to a pedestrian using a wheelchair. Curbed flares or rolled concrete flares must be located outside of the PAR. A non-walkable surface, such as grass, defines the limits of the PAR and will allow the installation of a curbed flare.
- The ramp flare, while traversable is not part of the PAR and a 4' minimum width must be provided between a ramp flare and a back of sidewalk.
- Connectivity between adjacent curb ramps must be provided and ADA compliant.
- 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. A TIF may be required to provide positive drainage.
- The sidewalk must slope towards the road to avoid drainage issues or ponding.

### **Quality Assurance / Quality Control**

It is the designer's responsibility to check, verify, and assure that the information contained in the design detail drawings **matches** the information provided in the inspection forms and TIF's. The District is not to be held responsible for multiple resubmissions or review timeframe due to poor designer's QA/QC. The District **will not** approve submissions with inaccurate inspection forms or TIF's.

### **Right-of-Way (See DM2- Chapter 6, Section 6.4)**

It is the designer's responsibility to evaluate and identify that existing right-of-way is available for the installation of the proposed curb ramps. The curb ramp design/detail must include right-of-way lines.

Property owners must be contacted in the early stage of the design process when the proposed curb ramp design(s) are expected to impact their property.

### **Pedestrian Access Route (PAR)**

A PAR 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 and lifts. Please note that the ramp flare, while traversable is not part of the PAR and a 4' minimum width must be provided between a ramp flare and a back of sidewalk.

#### 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, the longitudinal slope may match the adjacent roadway profile slope. For a PAR supported by structure, as in an underpass, overpass, or bridge, if the longitudinal slope exceeds 1V:20H (5.00%), the PAR must comply with ADAAG requirements for ramps, see section 6.8.B.2. This requirement also applies to reconstructed approaches. The requirements for ramps do not apply to sidewalks on existing bridges undergoing bridge preservation and partial deck replacement.

#### Cross Slopes

Transition cross slopes may not exceed 1V:50H (2.00%). A TIF is necessary if the transition cross slope exceeds 2% due to constraints generated by existing buildings, roadway profiles and curb elevations, etc.

Please note that the proposed transition cross slopes should not exceed the existing cross slopes whenever possible.

#### Obstructions (Unobstructed Width)

The minimum unobstructed width of 48 inches is required to provide the necessary room for pedestrians using wheelchairs. However, a minimum clear width of 36 inches can be acceptable on a case by case basis. (This is compliant with PROWAG and ADAAG)

### Steps and Building/Home Entrances

The integrity of the sidewalk (longitudinal and cross slopes) must be maintained (not to exceed existing slope values) in front of a set of steps or/and in front of building entrances for at least a clearance width of 2 feet. Sidewalk transitions should start after this 2 foot clearance.

If maintaining a 2 foot clearance in front of the steps results in steep transition slopes (slopes greater than 8.33%) between the edge of the 2 foot clearance and the landing of the curb ramp, alternative designs must be evaluated on a case by case basis (i.e. an alternative design that includes the 2' clearance area as part of one constant slope could be evaluated).

### Landing Requirements

#### Size

A minimum of 4'x4' (48 in x 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 5'x5' (60 in x 60 in). A minimum landing of 4'x5' landing is required when designing type 2 and type 6 curb ramps.

#### Slope

The longitudinal and cross slopes must not exceed 1V:50H (2.00%).

### Curb Ramp

#### Elements

The elements of the ADA curb ramp include the flares, the actual curb ramp and the landing.

#### Limits

The limits of the curb ramp include the depressed curb installed at the road. However, the width of the curb ramp is not included in the ramp length. The depressed curb must be flush with the roadway and have the same cross slope as the roadway profile. Transition the curb ramp cross slope from a level landing to match existing roadway profile at a cross slope rate of change not to exceed 3% per LF. The cross slope transition

must be completed prior to the DWS panel or consider using 12” tiles for DWS. If 12” tiles are used, then a callout should be included on the plans. The longitudinal slope of the top of the depressed curb should match the slope of the ramp, landing area or triangular area that is adjacent to the depressed curb.

The Curb Ramp must be located within the limits of the crosswalk.

### Longitudinal Slopes

Use flattest gradient possible. Ramp slopes between 5.00% and 6.25% are preferred for easier access. 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. It may be necessary to limit the run of a parallel or perpendicular curb ramp in order to avoid chasing grade indefinitely. 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. Please note that greater slopes will require the completion of technical infeasible forms.

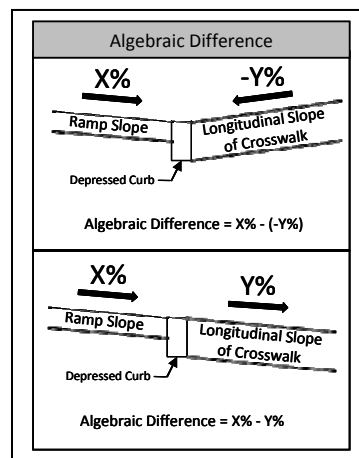
Note: Due to right-of-way limitations and significant number of utilities in urban areas; significantly reduced longitudinal ramp slopes are not encouraged as they typically require larger transition areas.

### Cross Slopes

The cross slope is perpendicular to the direction of travel. Please note that when pedestrians perform turning maneuvers, the cross slope changes direction with relationship to the pedestrian. A TIF is required for cross slopes exceeding 2%.

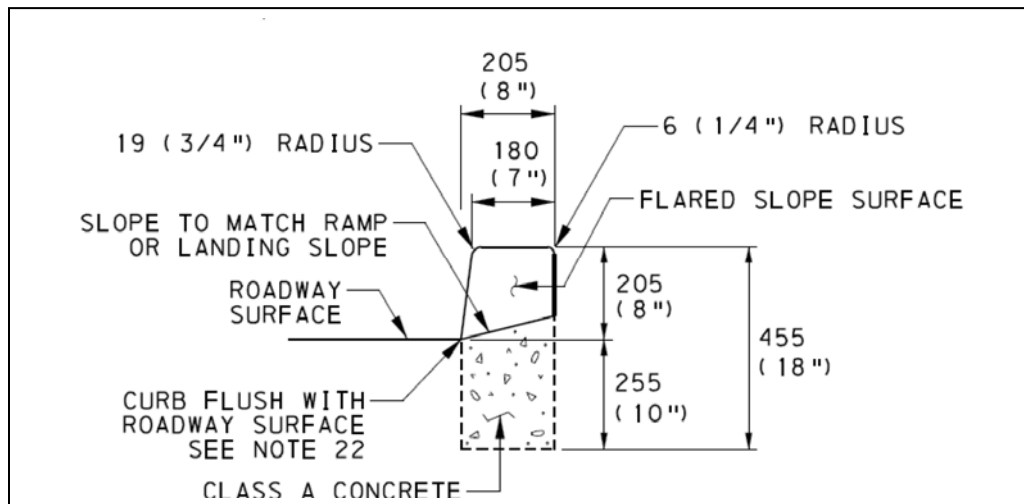
### Algebraic Grade Difference

The algebraic difference between the gutter slope and the curb ramp slope shall be no greater than 11%. This may be accomplished by providing a 24-in. transition strip set at a maximum slope of 2%. This transition strip at the bottom of the ramp typically includes the required detectable warning surface for the ramp.



## Depressed Curb

Construct depressed curb for curb ramps flush with adjacent roadway. Grade edge of road elevations at the flow line to ensure positive drainage and prevent ponding. For level landings behind depressed curbs, adjust slopes to provide positive drainage.



## Triangular area

To prevent an uneven surface for wheelchair users, a triangular level landing is required at the bottom of the curb ramp.

The triangular area landing must not exceed a cross and longitudinal slope of 2%.

The grade break (start of the ramp) is after the level landing and perpendicular to the travel direction. This will allow for both wheels of the wheelchair to make contact with the grade break at the same time.

For level landings behind depressed curb, adjust slopes to provide positive drainage.

## **Detectable Warning Surfaces (DWS)**

Detectable warning surfaces are required where curb ramps, blended transitions, or landings provide a flush pedestrian connection to the street. 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. DWS will not be installed at residential driveways. Detectable warning surfaces must be provided at the junction between the PAR and commercial driveways provided with traffic control devices or driveways that are otherwise permitted to operate like public streets. Engineering judgment should be used to determine if there is enough vehicular traffic to warrant the installation of DWS at commercial driveways and commercial driveway aprons.

### Materials

The following DWS materials are approved and accepted by the Department (See Bulletin 15):

- Cast Iron,
- Polymer Concrete, and
- Polymer Composite.

### Width

The DWS must span the entire width of the curb ramp, exclusive of flares.

### Slopes

The DWS material is rigid and can not be easily warped. Therefore, a constant slope must be provided across the entire length and width of the DWS. Please note that as an alternative 12 inch tiles can be use along the entire width of the DWS. The adjacent DWS tiles must be placed with manufactured surface to manufactured surface. The tiles can be cut only along the perimeter.

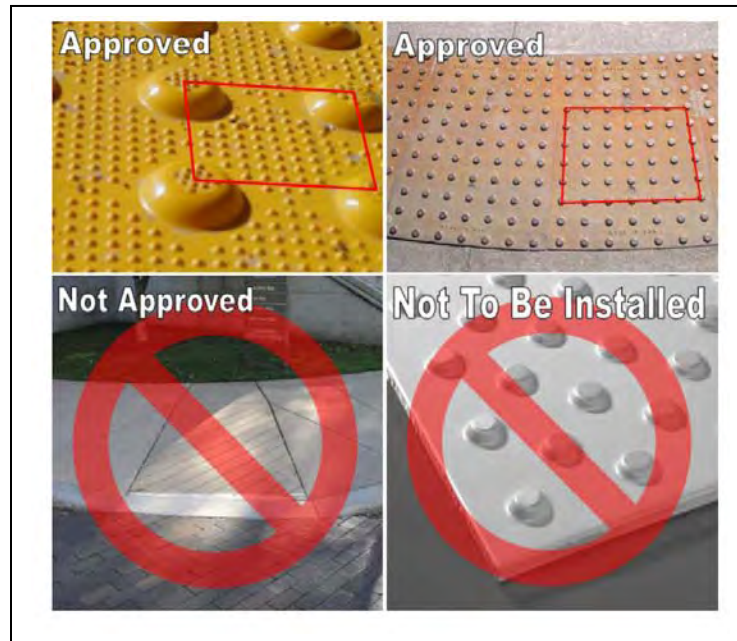
The slope of the DWS must also share a constant slope with at least one side of the curb ramp, unless a 2.0% transition strip is required.

### 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 primary direction of the ramp and perpendicular to the curb. 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.

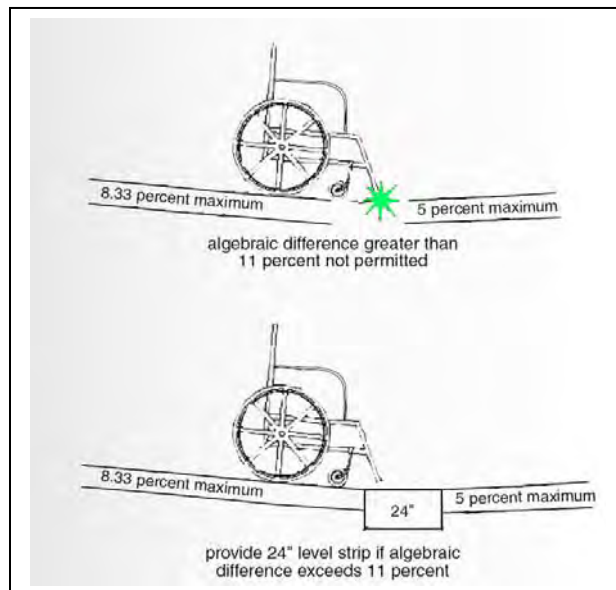
The contractor must pay close attention to this requirement since this can make the curb ramp design unacceptable even after constructed under approved guidelines.



### Transition Strip

A transition strip has a 2% maximum longitudinal slope in order to avoid an 11% algebraic grade difference. If the Transition Strip is greater than 2%, then a TIF is required and proper justification must be provided. A DWS may be installed on the transition strip. See RC-67M sheet 8 for details.

A TIF is required for cross slopes that exceed 2%.



### Location

If the distance between the depressed curb and the bottom of the ramp exceeds 60" (long edge of the triangular landing area), a radial DWS must be installed. Otherwise, the DWS must be placed perpendicularly of the direction of the ramp (irrespective of the crosswalk alignment). ***The DWS is not a directional aid for the visually impaired.***

### Additional Details

The tiles of the DWS can consist of 1'x1', 2'x4' and 2'x5'. These tiles can be cut and installed in order to accommodate the curb ramp designs. (See RC 67M – sheet 8)

Adjacent DWS tiles must be placed with manufactured surface to manufacture surface. The tiles can be cut only along the perimeter.

### Flares

Traversable flare slopes must not exceed 10.0%. If this is not feasible, a TIF and proper justification must be provided. The ramp flare, while traversable is not part of the PAR and a 4' minimum width must be provided between a ramp flare and a back of sidewalk.

A TIF is not required for non-traversable flare that is protected by an obstruction (i.e. utility pole, signal pole, fire hydrant, etc.). Include a note in the comment column justifying a rolled flare or non-compliant flare slope.

Utility poles and other obstructions may be located in the flare of the ramp. Water and gas valves can be located within the flare as long as they are completely flush.

### Cheek-walls

Do not install cheek-walls that intersect the PAR. Do not create unexpected vertical drops. Use engineering judgment when installing/designing cheek-walls in order to avoid tripping hazards.

*Property owners must be contacted when the cheek walls directly impact their property*; this contact must be made during the first stages of the design process. Avoid installing cheek walls in front of property entrances, windows, and



foundations. The use of Cheek-walls requires approval from the ADA Coordinator.

The height of the cheek-wall must be clearly indicated in the plan details.

When lowering sidewalks, a cheek wall or grading (3:1 max slope) must be shown on the plans. Consider grading in lieu of cheek walls where feasible.

To prevent the creation of tripping hazards, curb returns will only be approved where non-walking surfaces (full width grass area) can be provided adjacent to the curbs.



## **Push-Buttons**

### Location

For alteration projects with signal improvements, a TIF is required for an existing or proposed push-button that cannot be located as indicated on RC-67M sheet 8 (See note 26) or as required in Publication 149 – Chapter 19.

For curb ramp alteration projects, provide access to the existing push buttons to the maximum extent feasible (A TIF may be required). Push button pedestals are not required; however, they may provide the best solution. Push button pedestals should be located so as not to create obstructions for pedestrians.

### Extension Arm

The Pedestrian push-button must be within 10" of the level landing (or PAR if a turning movement is not required). The level landing or PAR should be extended to meet this requirement. If extending the landing or PAR is not feasible, then a push-button extension arm can be installed, however, the length of the extension arm cannot exceed *12 inches (12")*. Use engineering judgment when installing/designing extension arms in order to avoid hazards and/or equipment damage.

The installation of additional push-buttons stubs is only recommended if a Pedestrian push-button cannot be installed within 10" of level landing. Engineering judgment must be used to avoid unnecessary pedestrian obstructions.

### Height

The push-button height is 42 inches. The push-button height must be evaluated and addressed if necessary for all projects.

### Turning area

Push Buttons should be located so that the vibrotactile feature can be contacted from the level landing serving a curb ramp, (if provided), or from a clear space that is in line with the crosswalk adjacent to the vehicle stop line. Maximum horizontal reach is 10". See RC-67M sheet 8 for more details.

A 4' x 4' area in front of a push button is required. For projects where the scope of work is limited to the installation of curb ramps, the installation of a 4' x 4' area in front of a push button is required to the maximum extent feasible.

A 4' x 4' area with a slope max of 2% in front of a push button is required when turning maneuvers are expected from the pedestrian/wheelchair (very common situation). If this requirement cannot be met then a TIF is required.

When providing a directional ramp, and the pedestrian/wheelchair is only expected to move forward or parallel from the push button (not turning), the 2% slope is **preferred**; however, a 4' x 4' area is required.

## Ramp/Crosswalk Orientation (Angle)

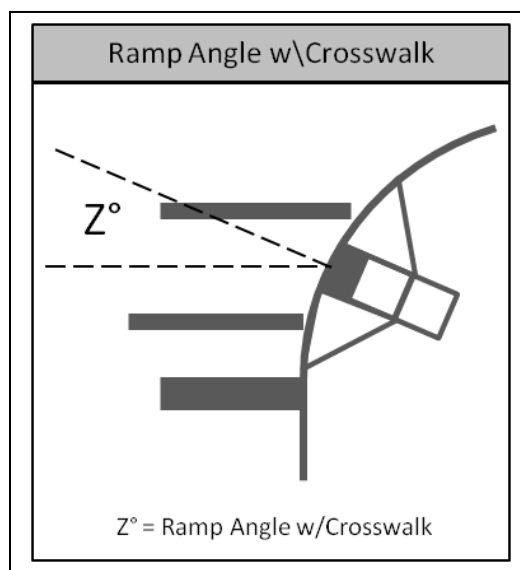
Curb ramps must be oriented in such a fashion that the grade break is approachable by a pedestrian in a wheelchair. This can be accomplished by installing the curb ramp perpendicular to the curb. This allows for a wheelchair to make contact with both wheels before experiencing a change in grade. This may cause the curb ramp to not be in alignment with the crossing direction. However, this may cause the curb ramp to not be aligned with crosswalk. The curb ramp may be installed in the same direction as the crosswalk and not perpendicular to the curb by providing a triangular landing as noted above. This provides non-visual cues for pedestrians with visual disabilities.

Provide the ramp angle on sheet 1 of the inspection form.

If the angle between the ramp and crosswalk is less than or equal to 20° then no further documentation is required.

If the angle between the ramp and crosswalk is greater than 20° and less than or equal to 44°, then a note must be provided on the Design Sheet and inspection form justifying the ramp angle and the location of the ramp.

If the angle between the ramp and crosswalk is greater than 44°, then a 4'x4' turning area at 2% maximum within the roadway is required. See RC-67M sheet 7 for clear space details. If a 2% turning area is not feasible then a TIF must be prepared. In addition, the forms must be changed to "Turning Maneuver in Street" to "YES".



## Sidewalk Transition Slopes

Label the existing and proposed longitudinal transition slopes approaching the landing.

The longitudinal transition slopes should be designed to 5% maximum, whenever possible.

If the transition slope is designed between 5%-8.33% then a justification must be added to the inspection form.

If the transition slope is greater than 8.33% then a TIF will be required. The transition area should not extend more than 15' from the landing (unless extending 1'-2' further will reduce slopes below 5% or 8.33% thresholds).

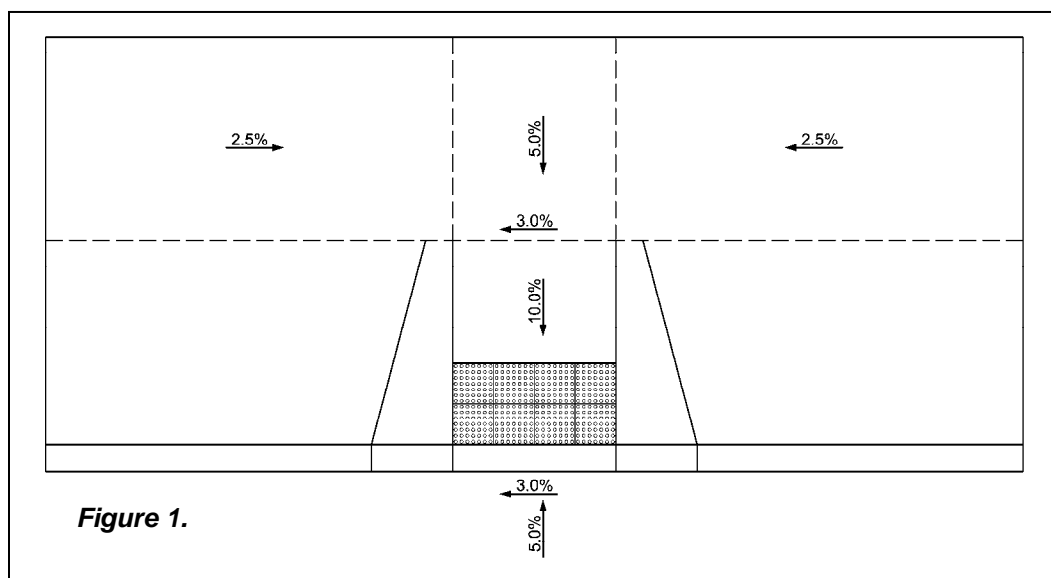
## Design Balance

The use of engineering judgment must be implemented when there are significant constraints that present design challenges. The District considers a ramp that has 2 or 3 features slightly out of compliance as a more favorable design as oppose to a design that only has one feature that is extremely out of compliance. Alternative designs can be modified and approved to create a more suitable design. For example, such modifications include:

- Ramp cross slope transition to roadway profile
- A marginally longer transition zone
- An increase in the ramp slope (Requires a TIF)
- An increase in the landing slope (Requires a TIF)
- Transition zones shall not be constructed that reduce the accessibility of existing building entrances. The designer shall be aware of Building Code requirements for maneuvering clearances adjacent to door openings.

The sample problem shows the iterative process of achieving a balance between all of the ramp elements (algebraic difference, ramp slope, landing slope, transitional slope) in order to provide a design that allows for the greatest possible access and is designed to the maximum extent feasible.

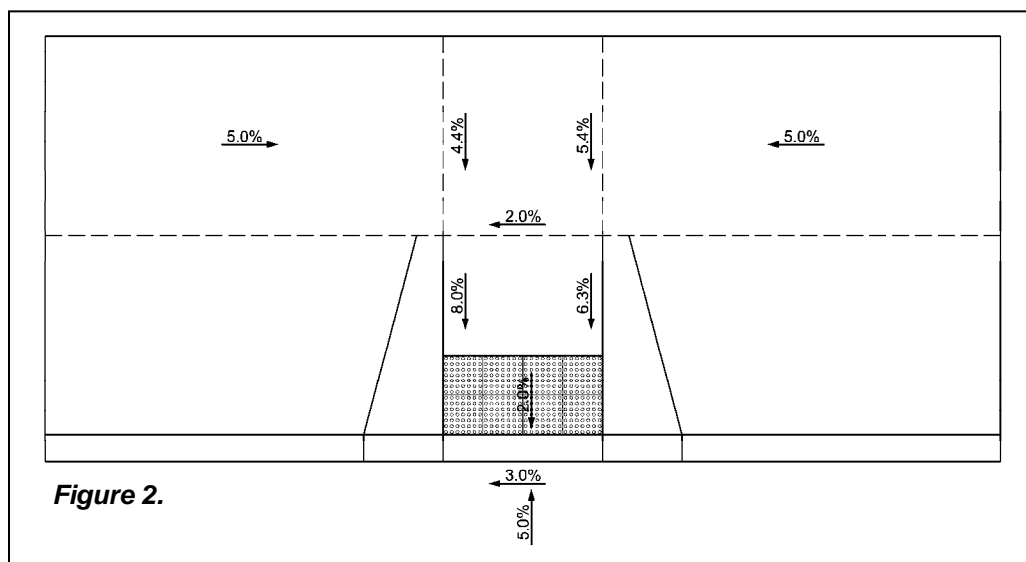
### Sample Problem



The design in Figure 1 above presents several non-compliant elements such as:

- Curb ramp slope greater than 8.33 %
- Algebraic grade difference greater than 11%
- Cross slope in front of the ramp greater than 2 %
- Landing slopes greater than 2%

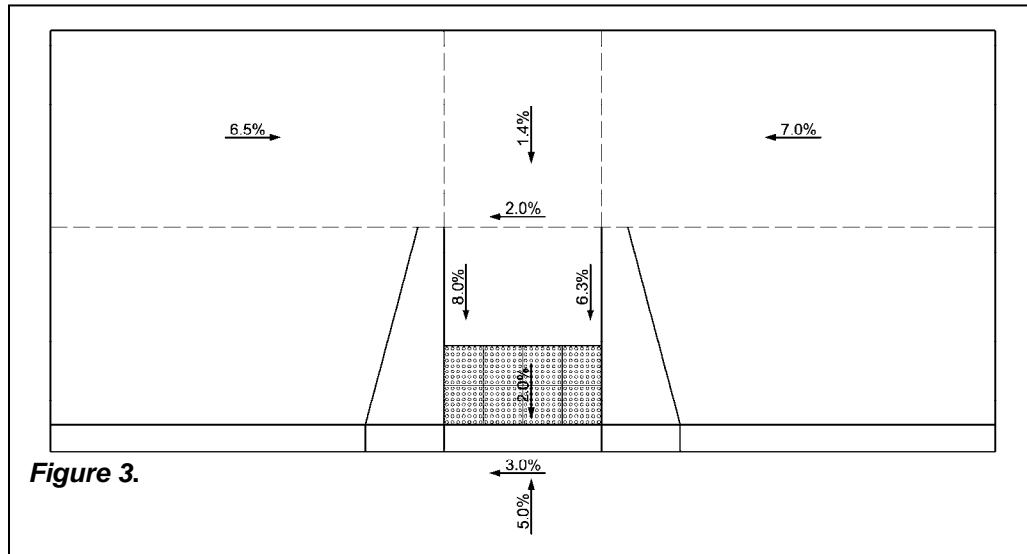
Although the longitudinal slopes of the sidewalk are compliant, this design is not acceptable and needs to be redesigned.



The re-design in Figure 2 still presents several non-compliant elements such as:

- Cross slope in front of the ramp greater than 2 %
- Landing slopes greater than 2%

This re-design provides a transition strips that mitigates the curb ramp slope and the algebraic grade difference; the longitudinal slopes of the sidewalk remain compliant. However, this design has not been evaluated to the maximum extent feasible and it is not acceptable.



**Figure 3.**

The re-design in Figure 3 above still presents non-compliant elements such as:

- Cross slope in front of the ramp greater than 2 %
- Sidewalk slopes greater than 5%

This re-design provides a transition strip that mitigates the curb ramp slope, the algebraic grade difference and the landing slopes.

Although the longitudinal slopes of the sidewalk are not compliant and the cross slope in front of the ramp is greater than 2%, this design was evaluated to the maximum extent feasible and it is acceptable with the following requirements:

- A TIF must be completed (cross slope in front of the ramp greater than 2 %).
- A justification must be included in the inspection explaining the reasoning for the sidewalk slopes greater than 5%

## **Diagonal Ramps**

Diagonal ramps may be considered for approval if, and only if, other alternatives have been fully evaluated and found to be infeasible. The diagonal ramp must provide the best alternative available.

The designer must provide adequate justification that other alternatives were fully exhausted.

All diagonal ramps require ADE approval. A TIF form with the ADE signature is the only valid proof that a diagonal ramp is approved.

### **Transition List**

The Transition List is a very limited list of ADA curb ramps that are infeasible to build under existing site constraint and scope of work limitations. The Transition List allows the State to address these ramps at a later date (usually an upcoming project with a larger scope of work) when the scope of work needed to make a compliant ramp can address the ADA issues. There must be an existing physical barrier or other justifiable reason for deferring the ADA ramp construction to the Transition List. Reasons must be justified and explained at the time of listing. A TIF form must be submitted for approval.

The TIF form must indicate the alternatives evaluated and the proper justifications for including the ramp location on a transition list. Please note that the TIF has a transition plan section on sheet 1 that must be completed as well.

### **Utilities**

Design the curb ramps to accommodate the existing utility facilities within the project unless otherwise noted in the project special provisions.

If utility relocations are part of the scope of work, notify the affected utility companies as part of the project construction effort in advance, secure the utility company approvals and incorporate their scheduling requirements in to the overall project schedule. Please note that vertical utility adjustments are considered minor adjustments and would not be considered out of the scope of work.

The designer is responsible to alert the contractor that coordination with the utilities is necessary if utilities need to be adjusted.

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.

*Sample:*

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. The limits will be determined by the District Utility Administrator Engineer using sound engineering judgment, considering factors such as ownership of the sidewalk, degree of impact, complexity of the solution and overall project scope.

As a rule of thumb, if the work disturbs 50% or more of the sidewalk width and the limit of sidewalk reconstruction are within 15' of a pedestrian crossing, curb ramp upgrades will be required for that corner or mid-block crossing. For projects over 300', 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' sidewalk disturbance would be required to extend 28.6 feet to upgrade a crosswalk or install a required curb ramp. The measurement will be from the end of disturbance to the existing (or missing) edge of landing or ramp.

### **HIGHWAY OCCUPANCY PERMITS**

ADA Curb Ramps will be required when the proposed development directly impacts the existing pedestrian path on a particular intersection or Driveway. Receiving ends must be included as part of the project only if the proposed development is a pedestrian generator and exceeds the number of pedestrians utilizing the existing facility.

The applicant must submit design drawing details, CS-4401 inspection forms and TIF's (if applicable) in conformance with Section II of this document. All ADA curb ramp designs must be approved prior the issuance of the HOP permit.

For those HOP permits that have been issued but not yet constructed, the contractor/designer is to provide the CS-4401 inspection forms and TIF's (if applicable) to the District's HOP inspector prior to construction of the ramps. The



CS-4401 inspection forms and TIF's (if applicable) must be approved before construction or permit close-out.

For those HOP permits that have been issued and constructed, the contractor/designer is to provide the CS-4401 inspection forms and TIF's (if applicable) to the District's HOP inspector. The CS-4401 inspection forms and TIF's (if applicable) must be approved before permit close-out.

PennDOT should complete, or verify the completed, Curb Ramp Inspection Forms (CS-4401) and approve the TIF's for all ADA Curb Ramps that may be impacted by future PennDOT paving efforts. The project sponsor should prepare and submit the TIF 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 driveways that provide access to or from State Routes.

Pedestrian facilities located outside of PennDOT ROW should include a note indicating the following:

*“ALL PROPOSED PEDESTRIAN FACILITIES REFLECTED ON THESE PLANS THAT ARE OUTSIDE OF THE PENNDOT LEGAL RIGHT-OF-WAY SHALL BE CONSTRUCTED TO COMPLY WITH THE FOLLOWING STANDARDS:*

- *PENNDOT DESIGN MANUAL 2, CHAPTER 6*
- *PENNDOT STANDARDS FOR ROADWAY CONSTRUCTION, PUB 72M, RC-67M*
- *U.S. ACCESS BOARD, PUBLIC RIGHT OF WAY ACCESSIBILITY GUIDELINES (PROWAG)”*

### **Driveway Details**

The DWS is only required for medium and high volume driveways. A 5'-0" wide continuous sidewalk with a 2.00% cross slope is preferred. At a minimum a continuous 4'-0" wide accessible path shall be maintained. If traffic control is not provided at the driveway, a DWS is also required.

For driveways, a 1 ½" maximum vertical lip at the depressed curb is acceptable since pedestrians will not cross the lip. The algebraic grade difference between roadway slope and driveway ramp slope cannot exceed 8.00%.

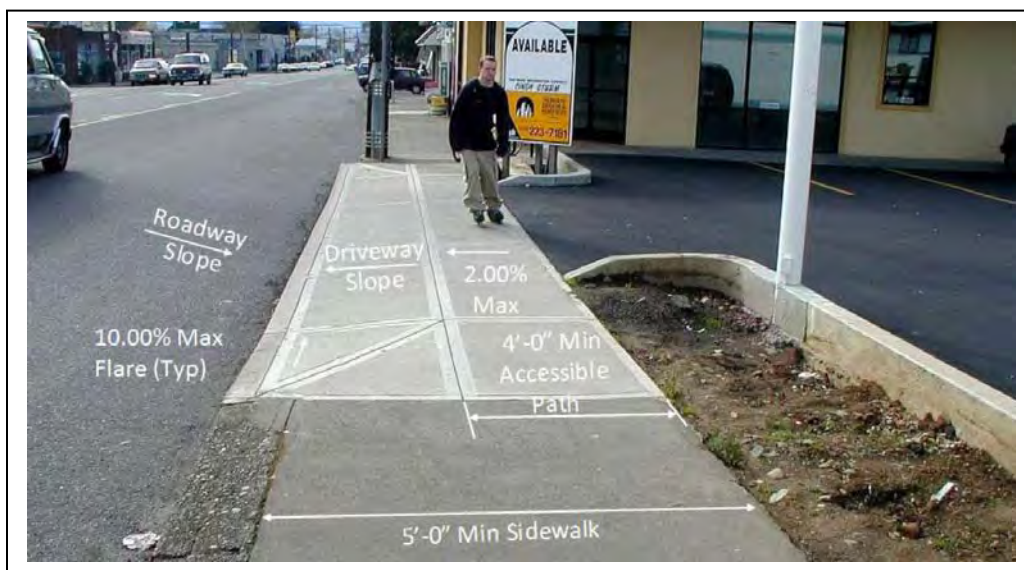
## Driveway Type 1

When the pedestrian path is separated with a non-walk surface a 24" (12" min.) flare must be provided.



## Driveway type 1A

Use 10.00% flares when the pedestrian path is adjacent to driveway flare.



## Driveway type 2

As shown, return curb may be used when the pedestrian path is separated with a non-walk surface.



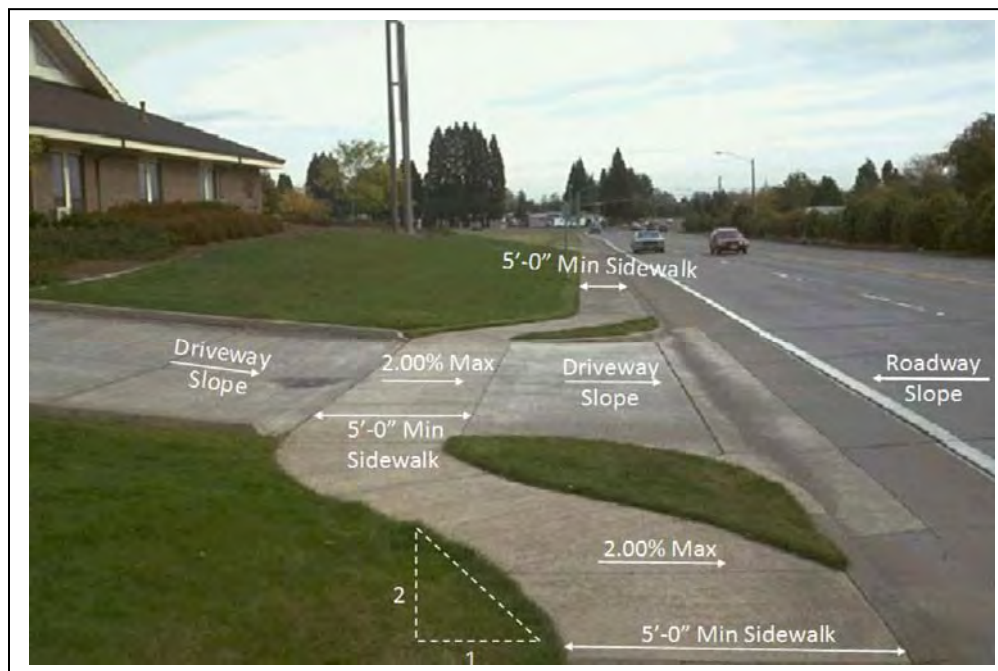
## Driveway type 3A

In this case, the sidewalk must be transitioned down at 8.33% maximum.



## Driveway type 4

In this case, the sidewalk should be transitioned away from curb at a 2:1 minimum as shown to provide additional driveway ramp slope length.



## **Technically Infeasible (TIF)**

Defined as alterations to an existing facility that 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 available space limits the use of flatter slopes. These curb ramps must use slopes that provide access to the maximum extent feasible.).

A "Technically Infeasible Form" (TIF) must be fully completed (sheets 1 and 2) for each curb ramp where a design value(s) is not compliant with the Department's regulations. The TIF must include sufficient justification to clarify why the proposed design is the best alternative (color photos are also required). The TIF should evaluate at least three alternatives and a summary must be provided. Submit two (2) color hard copies of the TIF form with the design drawing details

to the District ADA Coordinator for review and approval. Please note that the box on sheet 1 "Alternative selected & description of what requirement is not met" also needs to be completed.

Please note that if a particular element of the curb ramp cannot fully meet the standards and requires a TIF, all other elements of the curb ramp must be evaluated and designed to meet the standards to the maximum extent feasible. In other words, having a TIF for one element does not mean that the other elements can be included on the TIF without sound engineering evaluation.

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" 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.

### **V- SAMPLE COMMENTS**

1. Provide the longitudinal slope and cross slopes of the:
  - a. Adjacent Street in front of the curb ramps on the plan.
  - b. Existing sidewalk adjacent to the proposed curb ramps and landings.
  - c. Proposed curb ramps and proposed landing areas.
2. Dimension the curb ramps, landings and flares on the plan.
3. Clearly label the curb ramps in the plan so we can cross-reference the inspection forms.
4. Label the curb elevations on the plan for all tie-in locations.
5. All proposed curb ramps must provide positive drainage toward the adjacent roadway to prevent water from flowing onto the proposed curb ramp and sidewalk.
6. If a PAR width of 48" can not be provided at any given point, a TIF must be provided.
7. Label the cross slope of the landing, sidewalk transition and existing sidewalk on the plan.
8. Revise the ramp location diagram on Sheet 1 of the inspection form. The ramp location should be shifted to the other end of the corner radius.
9. Label the slopes of the triangular landing area on the plan.
10. The ramp appears to lead to an accessible path. Revise the inspection form and TIF accordingly.
11. A shared diagonal curb ramp is not typically acceptable. Revise / relocate the curb ramps to provide separate ramps for each cross walk. A level landing area (slope of 2.0% or less) must be provided.
12. Provide flares between the curb and the front of the landing area on each side of the ramp.
13. The sidewalk transition slopes may not exceed 5.0% for a Type 1 curb ramp. If it is not feasible to reduce the sidewalk transition slopes to 5.0% or less, a comment must be provided to justify slopes between 5.0% and 8.33%. A TIF will be required for slopes greater than 8.33%.
14. Check "Yes" for "Pedestrian Trip Generators" on Sheet 1 of the TIF.
15. Show the proposed crosswalk line striping on the plans.
16. The DWS must span the entire width of the curb ramp.
17. Dimensions from the plan must match the dimensions shown on the inspection forms.
18. Verify that water will not pond at the bottom of any curb ramps. Based on the elevations provided, many curb ramps appear to lie in a depression without drainage.

19. Verify the size of the existing grate openings.
20. Complete both pages of the TIF documents, when required. Summary information must be provided and photos must be included.
21. Enter the Date of Investigation and Field Investigators on Sheet 1 of the inspection form.
22. Verify that the ramp location is identified in all forms and TIFs.
23. The longitudinal and cross slopes in front of the ramp appear to have been reversed on the inspection form. The inspection form must be revised accordingly.
24. The inspection form indicates accessible push buttons, but no push buttons are shown on the plan. Revise accordingly.
25. The landing area must be a minimum length of 48". Revise the curb ramp design accordingly. If this is not feasible, a TIF must be provided.
26. The algebraic change in grade between the street and curb ramp appears to exceed 11%. Revise the design or inspection form accordingly.
27. Based on the plans provided, it is unclear how the curb ramps are proposed to transition from the cross slope of the existing street to the cross slope of the proposed landing. Please note the DWS material is rigid and can not be easily warped. Therefore, a constant slope must be provided across the entire length of the DWS. The slope of the DWS must also share a constant slope with at least one side of the curb ramp, unless a 2.0% transition strip is required.
28. Flare slopes must not exceed 10.0%. If this is not feasible, a TIF and proper justification must be provided.
29. The longitudinal slope of the curb ramp must not exceed 8.33% and the slope of the landing must not exceed 2.0%. Evaluate lowering the landing to provide compliant ramp and landing slopes. If this is not feasible, a TIF must be provided.
30. Connectivity and continuity must be provided between the push button landing and the curb ramp location.
31. The curb ramp must lie completely within the crosswalk line striping.
32. Specify the DWS material type on Sheet 1 of the inspection form.
33. Since the triangular landing area is longer than 5', the DWS must be aligned radial to the curb.
34. The proposed curb ramps are directional. As such, when directional ramps are installed on a curb return, a triangular level landing must be provided to transition the grade break. (See PennDOT RC-67M Sheet 8 of 13). Provide a triangular landing area between the curb-line and the DWS. In addition, the DWS must be placed at a 90 degree angle to the curb ramp unless the triangular landing is greater than 60" deep.
35. Include all non-compliant features in the TIF.
36. For purposes of constructability, adjust the limits of the transition sidewalk areas.

37. Show all proposed crosswalk line striping on the plans.
38. The slope of the curb ramp must not exceed 8.33% and the algebraic change in grade between the adjacent street and curb ramp must not exceed 11.0%. Re-evaluate the use of cheek walls or alternate ramp designs to provide compliant curb ramp slopes and compliant algebraic changes in grade.

#### **VI- Project Scope Evaluation and Determination**

For project scope evaluation and determination; see the most recent version of DM2 Chapter 6 sections 6.2 and 6.3.

#### **VII- Liaison with local government and private property owners (See DM2-Chapter 6, Section 6.4)**

Maintaining the proper liaison with local governments, school districts and property owners concerning the installation and funding of accessibility facilities is an important part of this policy. These entities 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.

Property owners must be contacted at the start of the design stage by the designer when the proposed curb ramp designs are to impact their property (See section IV, Right-of-Way and Cheek Walls of this document for further information).

Each project requiring pedestrian access requires an appropriate negotiated and finalized construction agreement among the parties involved that addresses financial and maintenance responsibilities. Please see the most recent version of DM2 Chapter 6 section 6.4 for further detail.



## **VII- CONTACTS**

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