Designing Pedestrian Facilities for Accessibility

Module 3
Curb Ramps & Blended Transitions
Curb Ramps & Other Transitions

• **Purpose:**
  - Allow pedestrians to transition between the street and sidewalks, islands, etc.

• **Typically installed at:**
  - Intersections (1 ramp at each end of each crosswalk)
  - Mid-block crossings (including trail crossings)
  - Accessible on-street parking spaces
  - Passenger loading zones & bus stops
R 304 Curb Ramps (R303)

- First required by the Rehabilitation Act of 1973, Section 504
- The implementing regulations under Title II of the ADA require curb ramps for existing facilities, as well as for all new construction
Curb Ramp Conundrum

- Curbs: cue for pedestrians who are blind or with low vision
- Curbs are a barrier for persons in wheelchairs
- Curb ramps remove the barrier for wheelchairs
- Detectable warnings are a “replacement” cue to indicate location of the street
Design Issues for Pedestrians Who use a Wheelchair

US Access Board Video
Persons Who Use Wheelchairs (10 mins)
Module 3: Curb Ramps & Blended Transitions

R304 Curb Ramp Components (R303)

- Approach
- Turning Space
- Approach
- Ramp
- Flare
- Flare

Gutter
Curb Ramp Components - Visual and Tactile Contrast

- Detectable warnings (truncated domes)
  - Visual
  - Tactile
- Covered in Module 4

High color contrast
low vision cue
Curb Ramp Alignment

- Curb ramps aligned with crosswalks help wheelchair users orient themselves to cross the street
- On small radius corner, curb ramp can be aligned with crosswalk and be perpendicular to curb
Curb Ramp Alignment

- Large Radius placement
R304 R303.2 Curb Ramp Grade (Running Slope)

- Recommended maximum grade to allow for construction tolerance - 7.1%
- Maximum grade - 8.3%
- Least slope possible is preferred
- When “chasing grade,” running slope length need not exceed 15’, but slope must be uniform (R304.2.2 and R304.3.2)
R304.2.2 Curb Ramp Length (R303)

Ramp Length = \frac{\text{curb height}}{(\text{ramp slope}) - (\text{sidewalk cross slope})}

- Sample curb ramp length calculation
  - Curb height/(8.3%-2%) = Ramp Length
  - Higher curb or flatter ramp grade = longer curb ramp

Turning Space

2 percent slope

8.3 percent ramp slope

curb ramp 2.419 m (95.24 in)

1.22 m (48 in)
Abrupt changes of grade are difficult to use and can cause wheelchairs to flip over backward or forward.
Change of Grade (Counter Slopes) (R303.3.5)

- PROWAG allows 8.3% ramp plus 5% grade at the adjacent street = 13.3%

- Best Practice:
  - If algebraic difference exceeds 11%, provide a 2 foot level area at base of curb ramp
Without the flat area, a wheelchair can get stuck at the bottom of the ramp or flip forward or backward.
R 304.5.1 Curb Ramp Width

- PROWAG min: 4’
- Wider ramps are better: full crosswalk or sidewalk width
Min. 4.0 ft. by 4.0 ft. turning space shall be provided at the top of the curb ramp and shall be permitted to overlap other landings and clear space.

Cross Slope (R304.5.3 as published)
- If Stop/Yield control: 2% max.
- If Signal/uncontrolled/midblock: match street grade

Cross Slope (expected revision)
- If Stop/Yield control: 2% max.
- If Signal/uncontrolled: 5% max.
- Midblock: match street grade
• Turning space should be 4 feet x 4 feet minimum
• Turning area may overlap or serve multiple ramps
• 60” min. in direction of pedestrian crossing when constrained
• Best practice: 60” x 60”
Turning Space

Planter strip & small radius make it easy to place 2 curb ramps per corner lined up with sidewalks, obstacle-free, and with turning space.

This square area is the level turning space that serves both ramps.
Without a turning space, user must turn while climbing, which is difficult for many users, and not compliant with the ADA.
Without a turning space, pedestrians continuing along the sidewalk experience severe cross-slope.
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Turning Space
Non-compliant curb ramps without a turning space may be retrofitted by adding a turning space behind the curb ramps.
R304.5.5 Clear Space (R303.3.6)

Bottom of curb ramp must have 48 x 48 inch clear space wholly outside the parallel vehicle travel lane and within the crosswalk.
R304.2.3 Perpendicular Curb Ramp Flared Sides (R303)

- Flared sides with a slope of 10 percent maximum, measured parallel to the curb line, shall be provided where a pedestrian circulation path crosses the curb ramp.
- Flares are not part of the pedestrian access route.
Advisory R304.2.3 No Flare Sides (R303.2.1.4)

- Returned curbs provide useful directional cues when aligned with the pedestrian street crossing.
- Flares are not needed if the sides of the curb ramp are protected from cross travel by landscaping, street furniture, chains, fences or railings.
Flared sides not needed in landscaped areas
Best Practice - Drainage at Curb Ramps

- To prevent standing water at the base of curb ramps:
  - Place inlets upstream of ramps
  - Widen the gutter pan and flatten at the curb ramp
  - The gutter pan counter slope must be flatter than the running slope of the curb ramp; a steeper gutter cross slope can resume outside the curb ramp
Add inlets upstream of ramps

Drainage Solution
Curb ramp surface should be smooth, texture makes them hard to climb
Module 3:
Curb Ramps & Blended Transitions

Types of Sidewalk/Street Connections

• Curb Ramps (running slope 5 - 8.3%)
  - R304.2 - Perpendicular curb ramps (R303.2.1)
  - R304.3 - Parallel curb ramps (R303.2.2)

• Blended Transitions (R304.4) - Blended transitions (running slope < 5%) (R303.2.3)
R304.2 Perpendicular Curb Ramps (R303.2.1)

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

- Grade: 5-8.3%

- Min. 4’x4’ turning space at top of ramp

- Flared sides if cross travel permitted
Perpendicular Curb Ramp Alignment

Module 3: Curb Ramps & Blended Transitions

TYPE 7

Cross slope not to exceed 2% on any portion of ramp or transition to street.

Ramp Width

Landing

Equal Ramp Slope 8.3%
R304.5.3 Perpendicular Curb Ramp Cross Slope (R303)

- Cross Slope (R304.5.3 as published)
  - If Stop/Yield control: 2% max.
  - If Signal/uncontrolled/midblock: match street grade

- Cross Slope (expected revision)
  - If Stop/Yield control: 2% max.
  - If Signal/uncontrolled: 5% max.
  - Midblock: match street grade
Perpendicular Curb Ramp

This is the level turning space serving both ramps.
Perpendicular Curb Ramps

- **Advantages**
  - Least likely to pond and trap sediment
  - User has setback from traffic while waiting to cross

- **Disadvantages**
  - Difficult to provide a good path of travel on large radius corners
  - Require a lot of space - a wide sidewalk, a curb extension, or a planter strip may be needed to accommodate the curb ramp and the level landing
R304.3 Parallel Curb Ramps (R303.2.2)

- Parallel curb ramps shall have a running slope that is in-line with the direction of sidewalk travel.
- Grade: 5-8.3%
- Min. 4’x4’ turning space at bottom of ramp
Parallel Curb Ramps

- The ramp is parallel to the curb and the pedestrian’s direction of travel on the sidewalk

Curb at rear not required, but retains soil and provides edge for pedestrians with visual impairments
• Cross Slope (R304.5.3 as published)
  - If Stop/Yield control: 2% max.
  - If Signal/uncontrolled/midblock: match street grade

• Cross Slope (expected revision)
  - If Stop/Yield control: 2% max.
  - If Signal/uncontrolled: 5% max.
  - Midblock: match street grade
Parallel Curb Ramps

• Advantages
  - Fits within narrow ROW

• Disadvantages
  - Users continuing along the sidewalk must negotiate ramp grades
  - Careful attention must be given to the construction of the bottom turning space to limit accumulation of water and/or debris
R304.4 Blended Transitions (R303.2.3)

- Running slope - 5 percent maximum
- Cross Slope as published (same revisions expected)
  - If Stop/Yield control: 2% max.
  - Otherwise: 5% max.
- No turning space is required
• Sidewalk elevation lowers to street with gradual change in slope
Blended Transitions

- **Advantages**
  - No turning space required

- **Disadvantages**
  - Children, persons with cognitive impairments, guide dogs may not distinguish street edge
  - May allow turning vehicles to encroach onto sidewalk
Diagonal (single) Curb Ramp

- Diagonal curb ramp is a single ramp located at the apex of the corner that serves both crosswalks
- Unacceptable in new construction
- Curb ramp must land within the crosswalk that it serves; diagonal curb ramps don’t and are not permitted under 2011 NPRM
Diagonal Curb Ramp

- **Disadvantages**
  - Forces wheelchair users out of crosswalk
  - Causes persons who are blind or with low vision to cross diagonally - projecting pedestrians into the center of an intersection
  - Do not serve either crosswalk well
• Instead of built-up ramps, use curb extensions (bulb outs) with perpendicular ramps at locations with on street parking
Combination Ramp

Module 3:
Curb Ramps
& Blended Transitions

Designing Pedestrian Facilities for Accessibility
Example #1

Existing Condition
Example #1

Possible Solution

Turning Space

Non-Walk Surface

4’-0”

5’-0” Min Sidewalk

Possible Solution
Example #2

Existing Condition

Diagonal Curb Ramp

Landing

9.00%

Pedestrian Crossing
Example #2

Possible Solution 1

- Curb ramp with return curbs
- Reduced curb height
- 8.33% Max
- 2.00% Max
- Pedestrian Crossing
Example #2

Possible Solution 2
Example #3

Turning Space

Possible Solution

Pedestrian Crossing

Possible Solution

Pedestrian Crossing