Designing Pedestrian Facilities for Accessibility (6-hour, online version)

Day 2

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Course Agenda

Day 1
--- Laws and Regulations
--- Pedestrian Characteristics
--- Pedestrian Access Route

Day 2
--- Pedestrian Access Route (continued)
--- Curb Ramps

Day 3
--- Curb Ramps and Other Transitions (continued)
--- Detectable Warning Surfaces

Day 4
--- Pedestrian Crossings
--- Accessible Pedestrian Signals
--- Street Furniture and On-Street Parking
Walkway Cross Slope (R302.6)

- The cross slope of the walkway of a pedestrian access route shall be 2 percent maximum

On Steep Cross Slopes . . .

- Pedestrians must work against gravity
  - Crutch, walker, and prosthesis users may be forced to walk sideways
- Wheelchair users must make significant efforts just to travel straight
Cross Slope Challenges

Sometimes building elevations make it difficult to create a proper cross slope

Cross Slope Solutions

Create a level area of preferably 6 feet (4 feet min.)
Cross Slope Solutions

Acceptable solution:
- Raise the curb but remember curbs higher than 8” create parking concerns
- Parallel parking - doors cannot be opened
- Diagonal Parking - overhang is impossible

Here the curb is stepped to allow diagonal on-street parking & sidewalks with good cross slope
Module 2: Pedestrian Access Route

Cross Slope Solutions

More Cross Slope Solutions
Module 2: Pedestrian Access Route

Designing Pedestrian Facilities for Accessibility

Grade (R302.5)

- In ROW and along road or bridge: follow general parallel roadway grade
- Crosswalk grade (street crown): 5% maximum (R302.5.1)
- In ROW and not along road (i.e. pedestrian over/underpasses): Provide ramp, lift or elevator per R407 (R204.4)

Sidewalk Not Serving Street—Max g = 5%
Running Slope Challenges for Users

- Uphill: requires people with mobility impairments to exert more energy
- Downhill: difficult for users of walkers, canes, crutches, prostheses

Best Practice: Reducing Impact of Steep or Long Grades

On steep or long grades, provide rest areas at reasonable intervals
If driveways are not done right, sidewalks won’t be used (most common reason given by wheelchair users using the street)
Module 2: Pedestrian Access Route

Driveway = Major Cross Slope Challenge

At noncompliant driveways, sidewalk users encounter:

- Steep Cross slopes
- Rapid grade change at driveway flare

Cross Slope at Driveway

Cross-slope on an old-style sloped driveway is often 5 or 6 times higher than the 2% maximum
Design Solutions for Sidewalks at Driveways

- Accessible driveway requires level pedestrian access route:
  - Cross slope: 2% maximum
  - Width: 4’ minimum (PROWAG)

- Factors to consider when choosing accessible driveway option:
  - Sidewalk width
  - Planter strip width
  - Curb height
  - Available right-of-way
  - Design vehicle

Best Solution - Planter strip allows for flat uninterrupted sidewalk
Inaccessible design - Constant steep slope across planter strip and sidewalk

7%

Solution for Sidewalk at Driveways
**Good Solution - Level accessible route at back of wide sidewalk**

PROWAG specifies 4 ft. min. level area

**Good Use of Landscaping**

- Nicely landscaped areas add curb appeal and direct pedestrians away from driveway apron.
- Note that a longer taper would be easier to use
Acceptable Variation - Driveway with Mountable Curb

Revert to vertical curbs before and after the driveway to discourage cars parking on sidewalk

Acceptable Solution for Narrow Sidewalks
Fully Lowered Sidewalk

- Possible problems:
  - Drainage
  - Users must negotiate two ramps
  - Peds who are blind may veer into street
  - Allows drivers to turn at higher speeds
• R302.7 Surfaces

• R302.7.1 Vertical Alignment

• R302.7.2 Vertical Surface Discontinuities

• Surfaces must be firm, stable, & slip resistant

• Should be smooth
Module 2: Pedestrian Access Route

Vertical Alignment (R302.7.1)

- Generally planar within pedestrian access routes (including curb ramp runs, blended transitions, turning spaces, & gutter areas)
- Grade breaks shall be flush

Vertical Alignment

- If changes not addressed, can be tripping hazards
- Can be inaccessible to wheelchair users
Vertical Surface Discontinuities (R302.7.2)

- Vertical surface discontinuities shall not exceed ¼ inch maximum
- Those between ¼ and ½ inch shall be beveled with a slope not steeper than 50% (bevel across the entire vertical surface discontinuity)

![Figure R302.7.2](image)
Module 2: Pedestrian Access Route

Tree Roots

Before

After

Minimizing Changes in Level

Temporary repairs often don’t meet standards but is better than leaving it as is
Utility Covers

Module 2: Pedestrian Access Route

Not Acceptable

Acceptable

Designing Pedestrian Facilities for Accessibility

Rough Texture Surfaces Can Cause . . .

- Tripping hazards
- Confusion to people who are blind in detecting tactile cues
- Painful to people with spinal cord injuries due to vibrations
- Maintenance difficulties

Designing Pedestrian Facilities for Accessibility
Best Practice: Concrete in the pedestrian zone, textured surface in furniture zone

Horizontal Openings (R302.7.3)

Walkway Joints & Gratings - Openings shall not permit passage of a sphere more than 0.5 inch in diameter. Elongated openings shall be placed so that the long dimension is perpendicular to the dominant direction of travel.
Module 2: Pedestrian Access Route

### Tree Grates

- Tree grates should be placed in the furniture zone, outside the pedestrian zone
- Tree grates expand the pedestrian zone for some users

### Quality Control of Grades, Cross Slopes and Widths

- Reliance on contractors & inspectors
- Tight construction tolerances are needed
- Inspections: actual measuring (not visual)
- Train carpenters, concrete finishers, and inspectors – some jurisdictions have certifications.
Example #1

Existing Condition

Example #1—Possible Solution

Possible Solution
## Design Issues for Pedestrians Who use a Wheelchair

### US Access Board Video

**Persons Who Use Wheelchairs (10 mins)**

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## 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
Curb Ramps (R 304)

- First required by the Rehabilitation Act of 1973, Section 504
- Title II of ADA require curb ramps for existing facilities, as well as for all new construction
- Considered the basic element of accessibility

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
Curb Ramp Components - Visual and Tactile Contrast

- Detectable warnings (truncated domes)
  - Visual
  - Tactile

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.

**Large Radius Placement**

![Diagram of a skewed intersection with large radius](image)
**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)

**Application of 15 Feet Chasing Grade**

![Application of 15 Feet Chasing Grade Image]
Curb Ramp Length (R304.2.2)

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

- Sample curb ramp length calculation—6” curb height
  - Curb height / (8.3% - 2%) = Ramp Length
  - Higher curb or flatter ramp grade = longer curb ramp

Change of Grade or Counter Slopes (R304.5.4)

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

- 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