Pedestrian Design for Accessibility Within the Public Right-of-Way

Introduction

The pedestrian facilities at intersections must be usable by pedestrians of all ages and capabilities. Intersections in particular must be designed to safely accommodate pedestrians of all ages and physical and mental abilities. Often, however, intersection designs fail to accommodate people with visual and mobility disabilities.

Figure 1: Intersections should accommodate all pedestrians

Intersection pedestrian features have traditionally been designed for people who are mentally and physically agile, with good stamina, vision, and hearing. However, according to the Census Bureau, approximately 15 percent of people age 5 or older have some disability.[1] This represents more than 41 million individuals.

The Americans with Disabilities Act (ADA) provides minimum design standards that are to be applied to all public environments, including the public right-of-way. These standards, the Americans with Disabilities Act Accessibility Guidelines (ADAAG), are the foundation for designing all pedestrian environments. Additional, specific requirements for public rights-of-way are currently in draft form.

Pedestrian accessibility enhancements not only benefit people with disabilities; they benefit all pedestrians as well. Examples include curb ramp improvements that assist people pushing carts or strollers and placing the WALK push buttons in a place that is accessible and easily understandable for all intersection users.

Rather than a standard for dimensions, the ADAAG should be considered minimum criteria. Entities are encouraged to design and set codes beyond the minimum standards to facilitate access for a wider spectrum of people. If designers are faced with designing a facility not specifically addressed within the guidelines, they are still responsible for making the features/facility accessible. The nondiscrimination requirements for usability by people with disabilities in ADA are the overarching regulations that must be applied.[2] It is critical for transportation providers to understand the details and principles for accessible design in order to apply good engineering judgment in difficult design situations. Pedestrian facilities with physical barriers, unusable sign and signal information, gaps in the system, and poorly designed features have critical safety implications for people with disabilities and may leave them stranded and unable to get to their destinations.

1. US Census Bureau, 2006 American Community Survey http://factfinder.census.gov/home/saff/main.html.
2. It is not the intent, however, that agencies be required to purchase right-of-way for the sole purpose of meeting ADA criteria. http://www.access-board.gov/prowac/draft.htm#ta.

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Challenges for Engineers and Designer

For pedestrians with disabilities, intersections can prove to be a challenge. Some of those challenges and design recommendations to better accommodate pedestrians with disabilities include the following:

- The assumption of pedestrian walking speeds of 4 feet per second (fps) is often inadequate.
- The pedestrian clearance time should be sufficient to allow a pedestrian crossing in the crosswalk who left the curb at the end of the WALK signal indication to travel at a walking speed of 3.5 fps to the far side of the traveled way or to a median of sufficient width for pedestrians to wait.[3] [4]
- A walking speed of up to 4 fps may be used to evaluate the sufficiency of the pedestrian clearance time at locations where equipment such as an extended push button press or passive pedestrian detection has been installed to provide slower pedestrians an opportunity to request and receive a longer pedestrian clearance time.[5]
- Where pedestrians who travel slower than 3.5 fps routinely use the crosswalk, a slower walking speed should be used in determining the clearance interval.
- The total of the walking interval and pedestrian clearance time should be sufficient to allow a pedestrian crossing in the crosswalk who left the pedestrian detector (or, if no pedestrian detector is present, a location 6 feet back from the face of the curb or from the edge of the pavement) at the beginning of the WALKING PERSON signal indication to travel at a walking speed of fps to the far side of the traveled way being crossed.

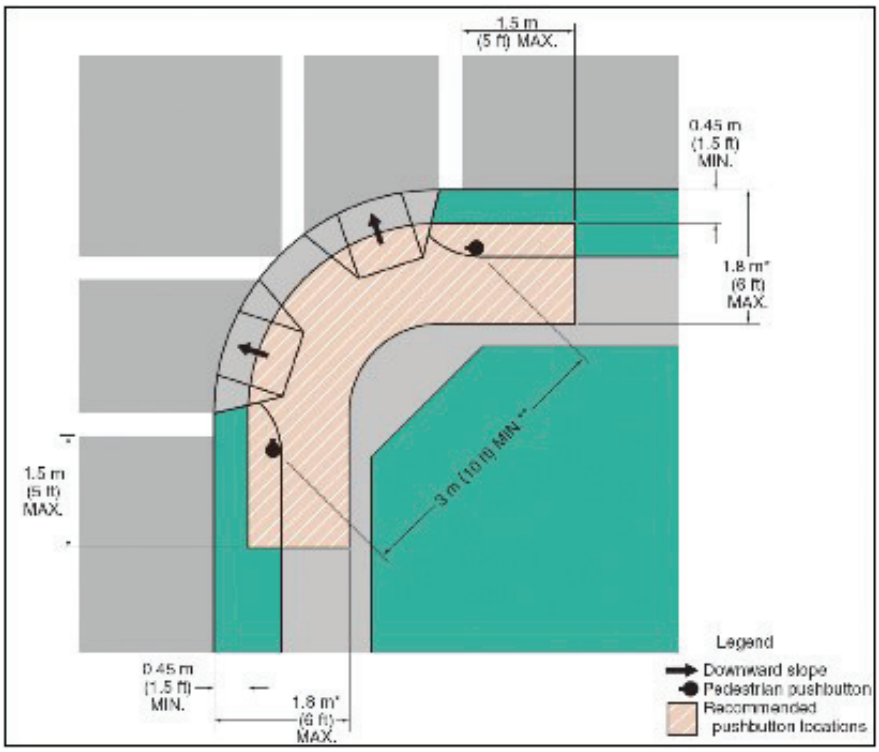

Figure 2: MUTCD, figure 4E-2 http://mutcd.fhwa.fhwa.dot.gov

Curb ramps are required at all crossings to provide access for pedestrians who use wheelchairs or who cannot step off a curb. Ideally, a separate curb ramp should be provided for each crosswalk (See Figure 3, which shows a curb ramp on only one side of the street). The ramp should have no more than 8.33% running slope and no more than 2% cross slope. A level landing/turning space is required at the top of a perpendicular ramp. Truncated dome detectable warnings are required at the transition to the street where there is no curb, to alert pedestrians who are blind to the edge of the street. Where possible, the curb ramp should be aligned with the direction of travel on the crosswalk so individuals with disabilities are properly aligned to cross and don't have to turn after entering the street. Design guidance for curb ramps in new construction and in alterations situations can be found in *Designing Sidewalks and Trails for Access, Part 2*, published by FHWA in 2001, and in *Special Report: Accessible Public Rights-of-Way, Planning and Designing for Alterations*, published in 2007 by the Institute of Transportation Engineers and the Access Board.

Curb ramps at intersections need to be designed so that they do not create an inaccessible condition for the pedestrians using the sidewalk and not crossing the street. The primary problem encountered in maintaining an accessible route is ensuring a 3-foot wide path with a cross slope of 2% or less is provided through the intersection (Figure 4 shows a cross slope that is too steep. This makes it difficult for a wheelchair user to negotiate a pedestrian accessible route).

At intersections, turning vehicles and the speed at which they travel pose the greatest threat to pedestrians, and often the motorist's attention is focused on other motorists.

- Intersections should be designed to reduce the speeds at which vehicle/pedestrian conflict occur.
- Conflicts points should be clearly defined for all users.

3. MUTCD 2008 NPA, Section 4E.10, FHWA, Washington, DC, 2008.
4. The ADA Draft Public ROW Accessibility Guidelines state, "Each crosswalk with pedestrian signal indication shall have an accessible pedestrian signal which includes audible and vibrotactile indications of the WALK interval." http://www.access-board.gov/prowac/.
5. Ibid.

Figure 3: View of a new perpendicular ramp with returned curbs on one side of the street, but vertical curb prevents passage on opposite side of the street

Figure 4: Example of a too steep cross slope

Skewed intersections can be especially problematic for pedestrians with mobility impairments. While the shortest crossing distance of a roadway occurs at aright angle, this is not usually the best approach for striping crosswalks at skewed intersections. Crosswalks at skewed intersections should be striped parallel to the adjacent roadway. The alternative, a crossing perpendicular to the roadway, places pedestrians out of the intersection area where motorists expect and are looking for conflicts. Accessible pedestrian signals (APS) should be used to provide positive guidance to pedestrians with vision impairments.

Right-turn-on-red, roundabouts and channelized right-turn lanes and other features designed to move traffic more quickly can be hazardous for people with visual disabilities. Pedestrians who are blind or who have low vision typically rely on the sounds of traffic stopping and starting as cues to signal phases, or to gaps in traffic as cues to cross at unsignalized locations.

In roundabouts and channelized turn lanes, sound created from constantly moving traffic from other lanes may mask the sound of a vehicle in the immediate lane being crossed. While a pedestrian who is sighted can cross in a gap just after a vehicle has crossed the crosswalk, a pedestrian who is blind may have to wait until the sound of that vehicle has faded before being able to tell if there is a gap in traffic.

- For roundabouts and single-lane channelized right-turn lanes, approaches should be designed to minimize vehicular speeds.

- For multi-lane roundabouts and multi-lane channelized right-turn lanes, a pedestrian activated signal complying with APS should be provided for each segment of each crosswalk, including the splitter island.

- In addition, the location of the crosswalk is usually not in the line of travel on approach so additional cues are needed in order for pedestrians who are blind or who have low vision to find the crosswalk. For example, low landscaping or barriers along the curb edge can prevent pedestrians from crossing at the wrong location and provide guidance to the crosswalk location.

At many intersections, pedestrian push buttons are located two per pole or are located such that the crossing they serve is unclear. Place pedestrian push buttons on the far side of the curb ramp (away from the parallel roadway) and perpendicular to the crossing.

Accessible Pedestrian Signals

The Manual on Uniform Traffic Control Devices (MUTCD) provides guidance and standards for accessible pedestrian signals in 4E.06 and 4E.09 (ref. 2003 MUTCD) and the MUTCD Notice of Proposed Amendment provides more specific criteria, based on new types of APS. New types of APS are integrated into the pedestrian push button and include speakers and vibrating surfaces incorporated in the pedestrian push button housing. These provide crossing indications to the waiting pedestrian at the departure curb rather than from overhead, as in older technology, and permit speaker volume to be set at a significantly lower and less obtrusive level. Tactile arrows and other features—push button locator tones, additional audible or Braille information, crosswalk maps, actuation indicators—enhance the effectiveness of these new devices.

Figures 5 and 6 show several of the push button-integrated APS devices available in the United States. All include a push button that is at least 2 inches in diameter, both audible and vibrotactile WALK indications, a push button locator tone, a tactile arrow and automatic volume adjustment. Configuration, functioning and adjustment methods vary somewhat by manufacturer.

Figure 5: APS example

Most push button-integrated APS can provide additional features. These may include Braille labels for street names, actuation indicators (a light or beep), tactile crosswalk maps, and options activated by an extended button push: audible beaconing (useful for directional guidance at irregular or long crossings), extended pedestrian timing and recorded information of street names or additional information about the intersection.

For further information, see NCHRP Web-only Document 117A, *Accessible Pedestrian Signals: A Guide to Best Practice*.

APS should be considered when:
- A request has been submitted for accessible pedestrian signals;
- There are traffic volumes during times when pedestrians might be present, including periods of low traffic volumes or high right turn-on-red volumes;
- There is complexity of traffic signal phasing (such as split phases, protected turn phases, leading pedestrian intervals, and exclusive pedestrian phases); and
- The intersection geometry is complex.

Questions to Ask During Project Development

Designing for accessibility is largely a matter of common sense on the part of the designer or engineer, once there is awareness and understanding. It means understanding the capabilities of users (children, elderly, people with cognitive, visual, and mobility disabilities) and knowing how a facility should perform for all pedestrians.

Some questions to ask:

- Are the sidewalks passable by people using wheelchairs, walkers, and strollers?
- Are crosswalks accessible?
- Are there curb ramps (two per corner where practical)?
- Do the ramps comply with ADA specifications (critical design aspects are the presence of a level platform at the top of the ramp, cross-slope of the ramp and wheelchair traps at the base of the ramp)?
- Is the ramp located in the path pedestrian travel (i.e., do people wanting to use the ramp need to divert from the most direct path)?
- Is the push button of an actuated pedestrian traffic signal accessible?
- Does it have a locator tone for people who are blind?
- Is the button proximate to the crosswalk?

Figure 6: Examples of APS

- Is it clear which crosswalk the button actuates?
- Is the button located within reach of a wheelchair user or child?
- Are there nonvisual cues that alert pedestrians to when they are leaving the sidewalk and entering the street (examples are curb, lip of an ADA ramp, or other tactile surface)?
- Is there an alternate route for pedestrians at construction sites?
- Are there cues at the site giving a person using a white cane the information that is needed to know there is a sidewalk closure or open pit?
- Does the information give cues on how to navigate safely around the site and not into the construction?
- Is there a wheelchair ramp at the site for users to navigate to the alternate route?
- Can pedestrians (especially those with low vision) see the pedestrian signal across the street?
- Is the pedestrian signal located on the same pole as the vehicle indication for conflicting movements (normally left and right turns) so that pedestrians understand vehicle conflicts and vice versa?
- Is the pedestrian signal located on the inside edge of the crosswalk so that a truck stopped at the intersection will not obstruct it?
- Are pedestrian signs easy to understand and interpret?
- Are there design features that create special challenges for visually impaired pedestrians (examples: right-turns-on-red, right-slip lanes, or roundabouts without controlled crossings)?

Resources

AASHTO Guide for the Planning, Design and Operations of Pedestrian Facilities, AASHTO, Washington, DC, 2004.

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11 ISSUE BRIEFS

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