Appendix D—Prioritization Tool Instructions and Forms

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Purpose of the Prioritization Tool

Municipalities responsible for the installation and operation of traffic signals are often required to make decisions about the use of accessible pedestrian signals. In many cases, there is a need to prioritize existing signalized intersections for APS installations. Two such cases include

- where the number of requests exceeds the funding available in a given fiscal year, and
- where transition plans for making intersections accessible are being completed and decisions must be made about the order of installations.

This prioritization tool provides practitioners with the means to take observable characteristics of a pedestrian crosswalk and produce a score that reflects the relative crossing difficulty for pedestrians who are blind or visually impaired. This scoring system enables a prioritization of APS installations within a jurisdiction.

The information regarding prioritizing intersections for installation of APS is **not intended** for application to new or reconstructed intersections. In new construction or reconstruction projects, it is appropriate to consider the Draft PROWAG as the best guidance available at this time. This guidance states that in new construction, APSs should be installed wherever pedestrian signals are installed.

Understanding How Blind Pedestrians Cross at Signalized Intersections

Before discussing how intersection and crosswalk characteristics affect the travel of blind pedestrians, it is important to understand how blind and low vision pedestrians travel. This section gives an overview of this issue.

At any given time, people who are blind or visually impaired can travel and cross streets using a human guide; a long, white cane to identify and avoid obstacles; using a guide dog guide; special optical or electronic aids; or no additional aid. Whatever aid is used, street crossing is composed of a number of tasks.

1) Locating the Street **—**First, pedestrians who are blind must determine when they reach a street. This is typically accomplished using a combination of cues, including the curb or slope of the ramp, traffic sounds, and detectable warnings.

***2) Street Recognition* —**Next, blind pedestrians recognize or determine which street they have come to. This information is only occasionally provided in any accessible format, so pedestrians who are visually impaired develop a mental map and keep track of where they are within that map, usually by counting blocks and street crossings. Assistance may be sought from other pedestrians.

***3) Intersection Assessment*—**Next, pedestrians who are blind obtain critical information about intersection geometry, including the location of the crosswalk, the direction of the opposite corner, the number of intersecting streets, the width of the street to be crossed, and whether there are any islands or medians in the crosswalk. Vehicular sounds, where there is a stream of traffic on each street at the intersection, are used to infer intersection geometry.

Pedestrians with visual impairments also need to identify the type of traffic control system at an intersection. This may be determined by listening to traffic patterns through several light cycles and searching the sidewalk area for poles with pushbuttons. However, it has become difficult or impossible to determine the type of traffic control at many intersections by listening. The inability to determine whether a crosswalk is pedestrian actuated may result in failure to use pedestrian pushbuttons and in crossing at times other than the pedestrian phase.

***4) Cross the Roadway* —**After determining the geometry of the intersection, aligning to face towards the destination curb, determining that the intersection is signalized, and having pushed a button (where necessary), pedestrians who are blind must recognize the onset of the walk interval. In the most common technique utilized for crossing at signalized intersections, pedestrians who are blind begin to cross the street when there is a surge of through traffic on the closest side of the street parallel to their direction of travel. Once pedestrians who are blind have begun to cross the street, they must maintain a heading toward the opposite corner. Turning traffic can make it difficult to establish a correct initial heading, and in the absence of traffic on the parallel street, pedestrians who are blind may veer toward or away from the intersection.

Optimal crossing conditions occur when crossing right angle signalized intersections with a moderate but steady flow of traffic through the intersection on each leg with a minimum of turning movements.

Pedestrian actuation requires blind pedestrians to locate and push a pushbutton and then cross on the next pedestrian phase to be assured of having enough time to cross. Blind pedestrians have three types of problems at these locations:

- They cannot wait through a light cycle to assess and refine their heading by listening to vehicular trajectories before crossing at the next pedestrian phase, because they have to locate and push the button again (and reestablish their heading).
- At a location with little vehicular traffic, even if pedestrians who are blind know there is a pushbutton and use it, they may not be able to detect the onset of the walk interval if there is no through traffic on the street parallel to their crossing.
- Blind pedestrians may not be aware that there is a pushbutton and/or they may be unable to locate the pushbutton. In addition, some locations do not include a pedestrian phase, and at times when vehicular volume is low, there may not be enough time to cross the street.

In the past 20 years, significant changes in intersection geometry, signalization, driver behavior, and automotive technology have affected the ability of blind travelers in the United States to obtain the information they need to cross streets independently and safely. Traffic clearing the intersection also commonly overlaps the pedestrian phase by as many seconds as the duration of the walk interval. In such cases, blind pedestrians will first perceive the pedestrian phase, and then initiate crossing after the onset of the pedestrian change interval. These changes have increased the requests for APSs by blind pedestrians. Municipalities and states need a documented procedure to respond to such requests as required by the program access requirements of the Americans with Disabilities Act.

Overview of Prioritization Tool Worksheets

The prioritization tool includes three separate worksheets that should be used for rating each intersection (blank forms included are included later in this appendix). The first worksheet is the *intersection worksheet* and is used for describing characteristics of the intersection as a whole, including space for a sketch of the intersection. The second worksheet is the *crosswalk worksheet* and is used for describing the features associated with each crosswalk at the intersection. A separate crosswalk worksheet should be completed for each crosswalk at the intersection. Each of these forms includes variables that either provide an assessment of level of difficulty that may be present for pedestrians who are blind or provide an indicator of the level of pedestrian activity in the vicinity of the intersection. The variables are further defined in the latter sections of this document. Each form also includes space for additional comments to be

provided. Finally, a *supplemental form* is provided for those locations where more drawings or additional notes may be required.

Scoring System

The APS prioritization tool provides a score for an individual crosswalk. Higher scores indicate a greater priority for APS installation. Lower scores indicate a lower priority for APS. There is no particular score that indicates whether APS should be installed or not. The scores are intended to provide a *relative prioritization scheme* among a group of crosswalks.

The system of scoring is based on the premise that it is the individual crosswalk that is critical, as opposed to the intersection as a whole. Therefore, priorities for installation should be established on the basis of individual crosswalks, rather than complete intersections. Jurisdictions may choose to install APS at all crosswalks of an intersection when installing them at one crosswalk. However, the intent is to rank and consider each crosswalk separately. If a scoring system were used that is based on the combined score of all crosswalks at an intersection, a very difficult crosswalk for blind pedestrians combined with three crosswalks that are relatively easy could result in low ranking for the intersection as a whole. Such an intersection-based system could result in critical crosswalks being missed on a priority list.

The total score for a crosswalk is calculated as the sum of the individual crosswalk score and the intersection score. The intersection worksheet includes the intersection worksheet score in the bottom right corner. The total crosswalk scores are found in the bottom right corner of each of the crosswalk worksheets. Each crosswalk worksheet includes the crosswalk worksheet score and the intersection worksheet score (transferred from the intersection worksheet), which are added together to get the resulting total crosswalk score. The total crosswalk scores can be listed on the cover sheet for quick reference.

Intersection Worksheet Sketch

The intersection worksheet includes space for a simple sketch of the intersection being rated. At a minimum, the sketch should capture the following:

- Crosswalk location and orientation, including skew and any change in direction (each one should be labeled—e.g., A, B, C, and D) for correct reference to the crosswalk worksheets.
- Location of pushbuttons and other signal features.
- Geometrics, such as islands and lane configuration.

Additional sketches and notes, as required, should be recorded on the wupplemental worksheet.

Intersection Worksheet Variables

Configuration

Pedestrians who are blind or visually impaired use the sound of traffic moving beside them as an alignment cue and as a cue for determining when the traffic signal changes. Therefore, the number of approaches to an intersection and the geometric configuration affects the difficulty of crossing. A standard four-leg intersection with perpendicular approaches is the easiest configuration. If those approaches are offset while still controlled by the same signal, the crossing becomes more difficult as it becomes harder to recognize the parallel traffic flow from the minor street. T-intersections are more difficult for similar reasons. Crossing the top of a T-intersection can be problematic due to the fact that the simultaneous traffic flow is from the stem of the T and is either turning right or left. Intersections with more than four legs can also result in ambiguous traffic flow cues for pedestrians with visual impairments.

Mid-block signalized locations are most difficult for blind pedestrians because there is no traffic stream parallel to the crosswalk to provide an audible cue. Given this, signalized mid-block crosswalks receive the highest point value in the configuration category (14 points). Since completing the remainder of the worksheets for a mid-block crossing may prove confusing, the categories that apply to a mid-block crossing have been listed in Table 1 .

Table 1. Applicable Variables for Mid-Block Crossings

Intersection Worksheet Variable	**Applies to Mid-Block Crossing?**
Configuration	Yes
Signalization	Yes, Actuated
Transit Facilities	Yes
Distance to Facilities for Visually Impaired	Yes
Distance to Major Ped Attraction	Yes
Crosswalk Worksheet Variable	**Applies to Mid-Block Crossing?**
Crosswalk width	Yes
Posted Speed Limit	Yes
Curb radius > 25 feet	No
Islands or medians	Yes
Transverse slope	No
Apex curb ramp	No
Channelized right turn island	No
Skewed crosswalk	No
Pushbutton actuation required	Yes
Non-concurrent WALK interval	No
Leading Pedestrian Interval	No
Timed for crossing to median island	Yes
RTOR permitted	No
Leading protected left turn	No
Protected right turn overlap	No
Channelized right turn under signal	No
Off-Peak Traffic Presence	Yes
Pushbutton location	Yes
Requests for APS	Yes

Signalization

The sequence of phases at a signalized intersection and other features of the signal operation, such as interval lengths and actuation-only phases, affects the ability of a blind pedestrian to determine when it is appropriate to cross. This information is captured in two places. The *signalization* variable captures information about the general signal operation that may affect the difficulty of crossing any or all streets. The *crosswalk signalization* variable on the crosswalk worksheet captures details about the signal operation that impact a particular crosswalk.

The following signalization options are given on the form. The user should select the option that has the highest point value AND applies to the intersection of interest. For example, if an actuated intersection has an exclusive pedestrian phase, then the user should select only "exclusive pedestrian phase", since that option has a higher point value than actuation.

Pretimed **—**Pretimed signalized intersections are the easiest for a blind pedestrian to understand, since the phase sequence and intervals remain the same in every cycle.

Actuated **—**Actuated signals are more difficult for blind pedestrians since the interval timing may change or phases may be skipped on each cycle. In addition, some actuated signals require the pedestrian to find and push a pushbutton to obtain a "Walk" interval. *Note: This intersection signalization variable is intended to capture actuation associated with vehicular traffic. Pedestrian actuation is captured within the crosswalk signalization variable on the crosswalk worksheet.*

Split phasing (on either street) **—**The auditory cues of split phasing can provide confusing information. Split phasing on the street parallel to the crosswalk can lead a blind pedestrian to believe they have the "Walk" interval because the cross street traffic is stopped and they hear a surge on the parallel street, not knowing that left-turning vehicles may be present.

In the image on the left in Figure D-1, a pedestrian going north on the east crosswalk (bottom right corner) will have the "Walk" indication. A pedestrian going north on the west crosswalk (bottom left corner) will have "Don't Walk" since the northbound left turning traffic has a protected turn. Without APS, if a blind pedestrian on the bottom left corner hears the northbound through traffic, they might assume that they have the "Walk" indication and cross the street — presenting a potentially dangerous conflict with northbound left-turning traffic which has a protected turn.

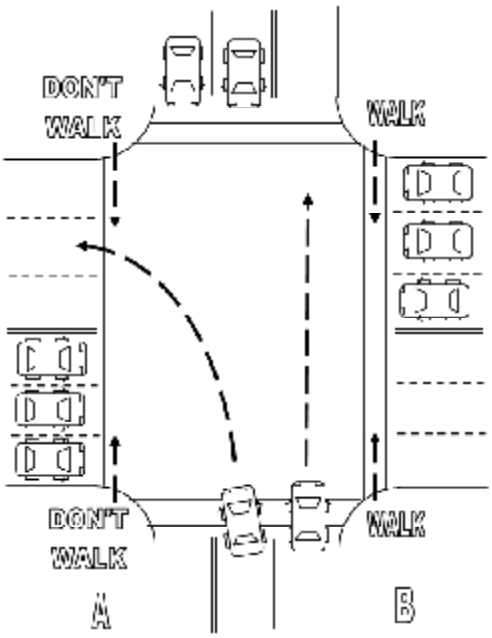

Figure D-1. Split phase illustration.

Split phasing on the street to be crossed can also be confusing in that the left-turning traffic onto the parallel street may be mistaken for the parallel street traffic surge. This variable does not include leading protected left turns; that signal feature is covered as a crosswalk-level variable.

Exclusive pedestrian phase **—**An exclusive pedestrian phase forces all vehicular traffic at an intersection to stop. It is much more difficult for a blind pedestrian to determine the onset of a walk interval when there is no vehicular movement and thus no surge of traffic. A lull in traffic flow may be perceived as the onset of the "Walk.". However, a lull in traffic may also be perceived as gaps in traffic or changes between phases, rather than the onset of an exclusive pedestrian phase.

Where RTOR is permitted in combination with exclusive pedestrian phasing, an intersection may never be quiet enough for pedestrians who are blind to be sure that the pedestrian interval has begun. If they cross at such intersections independently, they are likely to begin crossing well into the pedestrian clearance interval. Additional points should be added for RTOR (separate variable described below) when present.

Transit Facilities Within a Block (~ 0.12 mi) of Intersection—Any Leg

The availability of transit facilities within close proximity to an intersection will increase the likelihood of blind pedestrians, as well as sighted pedestrians, crossing at that intersection. The probability increases as the number of stops and routes increases, with the greatest probability occurring when there is a major transfer facility present, such as a transit mall or rail station. The levels on the prioritization tool account for transit activity by recording the number of routes that have stops within a block of the intersection. A single route will most likely be on the major street of an intersection. Multiple routes may include multiple major-street routes or a combination of major- and minor-street routes.

Distance to Facility Providing Services to the Blind or Visually Impaired

The closer a facility for persons who are visually impaired is to an intersection, the more likely it is that pedestrians who are blind or visually impaired will need to cross at that intersection. Facilities that fall into this category include an adult rehabilitation center, library for the blind, residential school for the blind, offices of rehabilitation counselors, and other centers providing services for people who are blind or visually impaired.

Knowing the locations of these facilities will be difficult for any transportation department without good communication with the blind community. It is the responsibility of the department and the blind community to maintain a working relationship with each other. Organizations such as regional associations for the blind would be able to inform the department of any new schools or facilities that provide services to persons who are blind or visually impaired.

Distance to Major Pedestrian Attractions

The intent of this variable is to serve as a surrogate measure for pedestrian usage at the intersection without having to make pedestrian counts. *Most agencies simply do not have such counts or the resources to acquire such.* Major pedestrian attractions include, but are not limited to major shopping areas, major cultural venues, educational campuses, recreational areas and medical facilities. The designation of "major attraction" will depend on the characteristics of the municipality. The idea behind this variable is that higher pedestrian activity will increase the chance of blind or visually impaired pedestrians crossing at the intersection, which would increase the need for APS.

Crosswalk Worksheet Variables

Crosswalk Width

Crosswalk width is defined as the curb-to-curb measurement taken at the midpoint of the crosswalk. A longer crosswalk increases the potential that pedestrians who are blind will veer out of the crosswalk, as well as making it more critical for the blind pedestrian to start as quickly as possible after the onset of the walk interval. In the case of a channelized right turn island, the crosswalk length should be measured from curb to island (Figure D-2). Widths less than 40 ft receive no points.

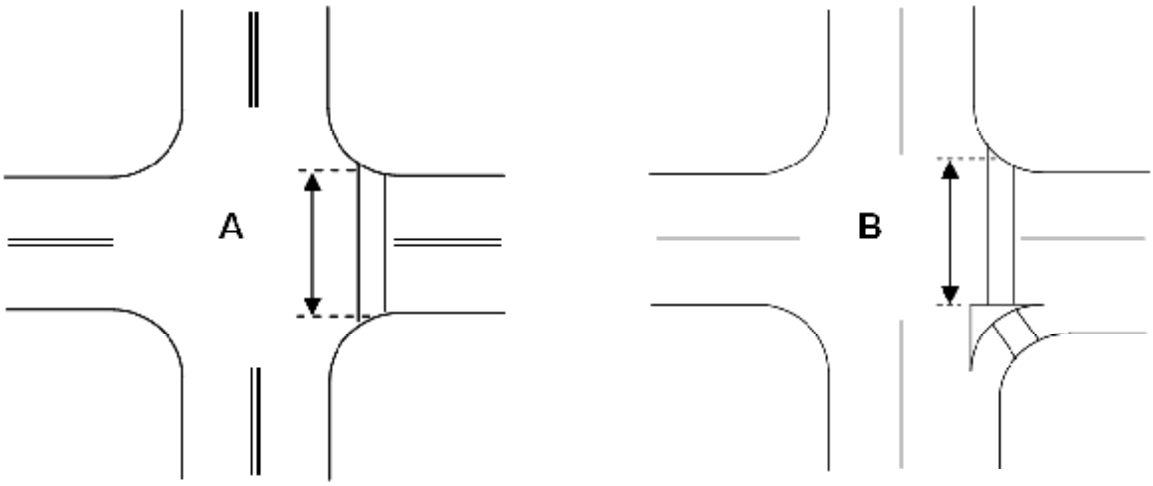

Figure D-2. Diagram A demonstrates the crosswalk width measurement of a standard crosswalk. Diagram B demonstrates crosswalk width measurement of a crosswalk at a channelized right turn lane.

Speed Limit (Street Being Crossed)

The higher the speed of the vehicles on the street being crossed, the lower the probability of avoiding an incident should a visually impaired pedestrian mistakenly step into the street, and the higher the probability of injury should a crash occur. Since operating speeds are not always available, the posted speed limit can be used as a surrogate measure. Speed limits of 20 mph and lower receive no points.

Approach/Crosswalk Geometrics

There are several geometric factors at a crosswalk that can negatively impact upon the ability of a blind pedestrian to safely cross the street. Each of the factors on the form under this heading is defined below.

Curb Radius > 25 ft (Either Corner)

It is more difficult to establish an initial correct heading where curb radii are wide. Incorrect headings can result in pedestrians who are blind walking toward the center of the intersection.

Islands or Medians

Raised or painted crossing islands and medians can confuse blind pedestrians during their crossing, slow or delay their crossing, affect crossing alignment, and generally make the crossing more difficult. Points should be added for any median or island, painted, raised, or cut-through, that crosses the crosswalk, particularly when the crosswalk changes direction at the island. **Islands that are present for channelized right turns are taken into account in the "channelized right turn island" factor.**

Transverse Slope on Crosswalk (Cross Slope)

Crosswalks with a severe cross slope (> 5 %) can lead to veering toward the downhill side by a blind pedestrian during the crossing. Depending on the direction of the cross slope, they could either veer into the intersection or into the approach leg. A beaconing APS may counter this tendency to veer.

Apex (Diagonal) Curb Ramp (Either Corner)

Where the slope of the curb ramp is not aligned with the direction of travel on the crosswalk, blind pedestrians may misalign for the crossing and walk into the flow of parallel traffic. This misalignment most commonly occurs with "apex" curb ramp configurations (Figure D-3). This apex configuration occurs when the corner only has one ramp that points toward the center of the intersection, usually for the purpose of serving two perpendicular crosswalks. If the corner has two ramps that each serves one crosswalk, the corner has a perpendicular ramp configuration (Figure D-4).

Figure D-3. Photo and sketch of an apex ramp configuration.

Figure D-4. Photo and sketch of a perpendicular ramp configuration.

Channelized Right-Turn Lane Island

Crossings at a channelized right-turn lane normally require the pedestrian to cross to the island in one direction, reorient themselves, and then complete the crossing in a different direction (see Figure D-5). This direction change is potentially confusing to blind pedestrians. Most of the right-turn lanes where such islands are present are unsignalized. Therefore, an APS will not be installed for the right-turn lane crossing unless a traffic signal is being added. The APS installation that should be considered at these locations is on island for the crosswalks that

cross the through travel lanes. The locator tones, as well as the "Walk" interval tones and speech messages, on an APS device under these conditions may assist the visually-impaired pedestrian with the reorientation that is required to find the correct crosswalk.

Note: Islands and medians separating traffic lanes in the middle of the road are taken into account by the "islands or medians" variable. If the right-turn lane is signalized, refer to the "channelized right turn lane under signal control" variable.

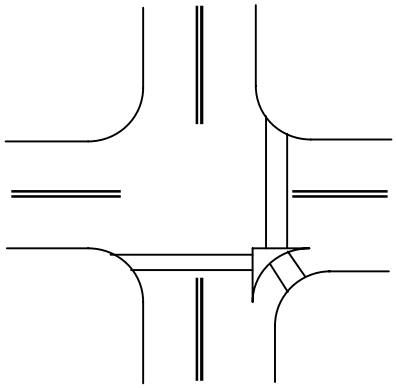

Figure D-5. Crosswalks at a channelized turn island.

Skewed crosswalk

If the direction of travel on a crosswalk is different from the direction of travel on the approaching sidewalk (is skewed), the consequence of failure to establish a heading toward the opposite corner is often that blind pedestrians will walk toward the center of the intersection and into the path of parallel traffic.

The degree of skew can vary from crosswalk to crosswalk. *Skew, in this case, is not defined by the angle at which the streets intersect.* If a blind pedestrian walking a straight line from the approaching sidewalk is headed toward parallel traffic lanes, the crosswalk is skewed (see crosswalk A in Figure D-6*)*. If the blind pedestrian would end up deviating from the crosswalk but would still arrive at the opposite corner, the crosswalk is not defined as skewed for this rating tool (see crosswalk B in Figure D-6*)*.

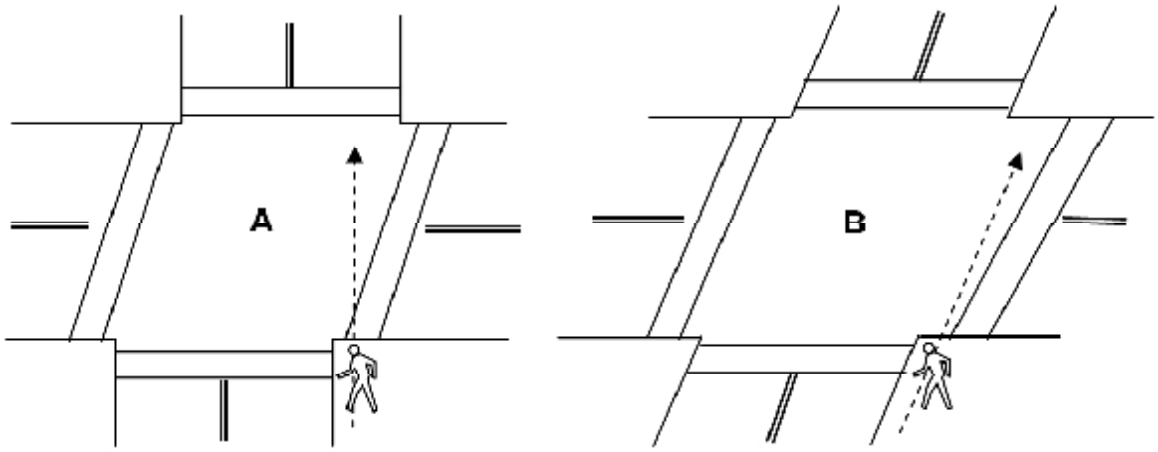

Figure D-6. Crosswalk A is defined as skewed because a pedestrian following the sidewalk line is headed toward the parallel traffic Crosswalk B is not skewed because a pedestrian following the sidewalk line is headed toward the opposite corner.

Skewing can also occur at crosswalks where the pedestrian walk signal only gives enough time for the pedestrian to reach a median. In this case, the blind pedestrian must be able to find the median to wait for the next signal cycle. A skewed or bent crosswalk may cause the pedestrian to miss the median. In this situation, the crosswalk is defined as skewed (Figure D-7).

Figure D-7. This crosswalk is defined as skewed because it is timed for median crossing (two-stage), and a blind pedestrian might miss the median due to the bent crosswalk.

Determination of skew should not consider the island of a channelized right turn (Figure D-5). Although crossing from curb to curb may involve a crooked path due to a direction change at the island, this disadvantage is already accounted for in the fields relating to channelized turn islands.

Pedestrian Signal Control

The ability of a pedestrian who is visually impaired to safely cross at a crosswalk can be impacted by the walk interval timing and other pedestrian signal control features. Each of these factors is defined below.

Pushbutton Actuation Required for "Walk"

At unfamiliar intersections, pedestrians who are blind have no way to know pedestrian actuation is required unless there is an APS with a locator tone. Therefore, pedestrians who are blind are unlikely to use pushbuttons at unfamiliar intersections and are more likely to cross relying only on the cue of traffic surge, whether or not it corresponds to the onset of the walk interval. Even if the parallel traffic surge is interpreted correctly, the green phase timing may not be sufficient to allow a pedestrian to safely cross the street. The problem is compounded when the pushbutton is not right beside the probable location of a pedestrian who is waiting to cross; this may require pedestrians who are blind or visually impaired to repeatedly leave their chosen starting location and heading and push the button again, and then return to their chosen starting location and reestablish their heading.

Nonconcurrent Walk Interval

Some signal timing plans at multileg intersections display the pedestrian "Walk" signal at a different time than the green phase for adjacent parallel traffic (
Figure D-8). Pedestrians who are blind or visually impaired will typically assume that the walk interval will begin with the onset of through traffic on the parallel street. Without an APS, they will not know the appropriate time to cross at such locations.

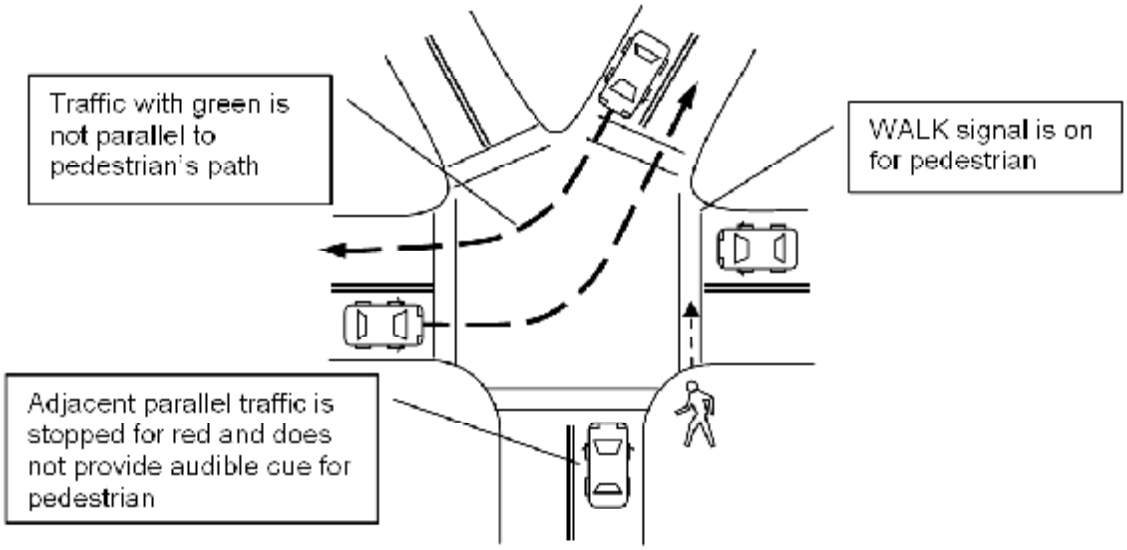

Figure D-8. Pedestrian crosswalk with nonconcurrent "Walk" interval.

Leading Pedestrian Interval—LPI (with Parallel Street Green)

The LPI permits pedestrians parallel to a traffic stream to move prior to the vehicles receiving a green signal, with a goal of allowing pedestrians to "claim" the crosswalk space prior to vehicles that may be turning right (Figure D-9). Unfortunately, this treatment creates a scenario in which blind pedestrians are unable to detect the beginning of the walk interval if there is no audible indication. Subsequently, they may begin crossing only when the parallel traffic starts, which may be too late in the pedestrian phase and at a time when drivers are not expecting them.

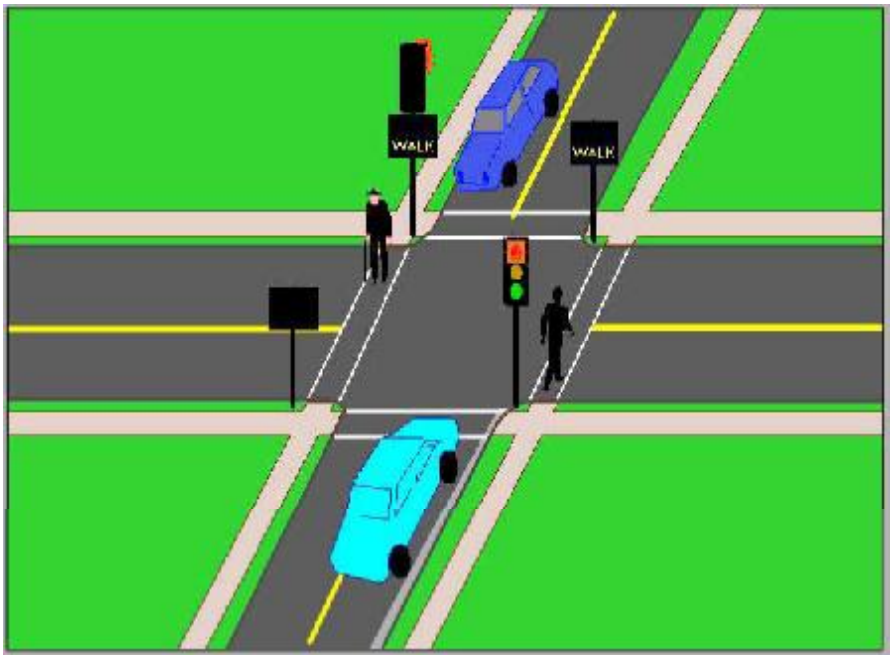

Figure D-9. Leading Pedestrian Interval (source: Insurance Institute for Highway Safety).

Timed for Crossing to Median Island

On wide streets with medians or crossing islands, blind pedestrians cannot easily determine whether the "Walk" signal is intended to allow them to cross the entire street or only to the mid-point. Without an APS providing an audible cue at the median, blind pedestrians are unable to recognize that they must stop there, which may place them in a high-risk situation. The MUTCD states*: "Where the pedestrian clearance time is sufficient only for crossing from the curb or shoulder to a median of sufficient width for pedestrians to wait, additional measures should be considered, such as median-mounted pedestrian signals or additional signing."* (MUTCD 2003)

Vehicle Signal Control

The types of signal phases available for vehicle traffic can greatly impact upon the ability of the pedestrian who is visually impaired to understand the audible cues from the traffic surges of various movements and make correct decisions about when it is appropriate to cross the street. Each type of signal phasing that may lead to this ambiguity is defined below.

Right-Turn-On-Red (RTOR) Permitted (on Parallel Street)

The allowance of RTOR on the parallel street may create a false audible cue for the blind pedestrian

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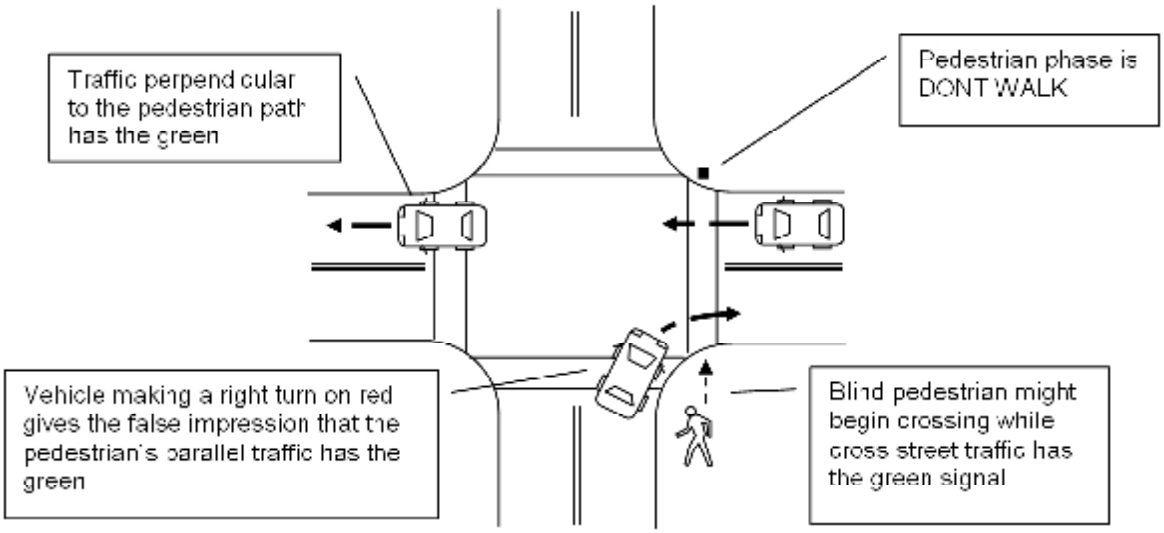

Figure D-10). Vehicles turning right after stopping may be interpreted as indicating the onset of the parallel green phase, and pedestrians who are blind or visually impaired may begin to cross the street at the wrong time. RTOR vehicles also make it harder to audibly recognize the onset of the parallel traffic movement.

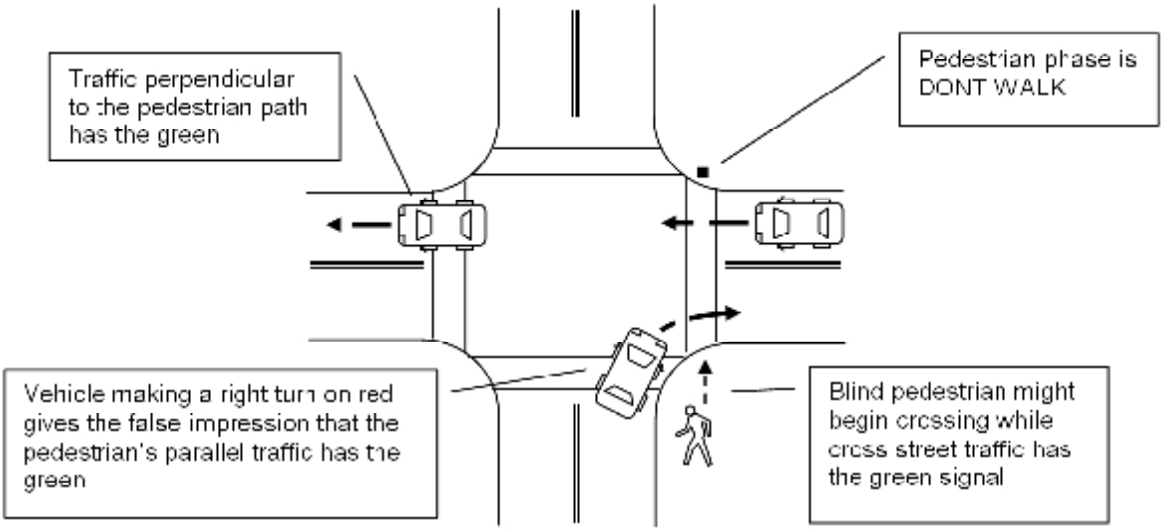

Figure D-10. Right turns on red can mislead blind pedestrians.

The allowance of RTOR during an exclusive pedestrian phase also sends mixed signals. If vehicles are turning, blind pedestrians may not be aware that they have a walk interval. If they do recognize it, there may be a delayed initiation of crossing which means they may not begin crossing on the walk interval and may still be in the street during the "Don't Walk" interval.

Leading Protected Left-Turn Phase (on Parallel Street)

It can be difficult for a blind pedestrian to audibly distinguish between the surge of traffic at the beginning of a protected left-turn phase and the beginning of the through traffic phase (

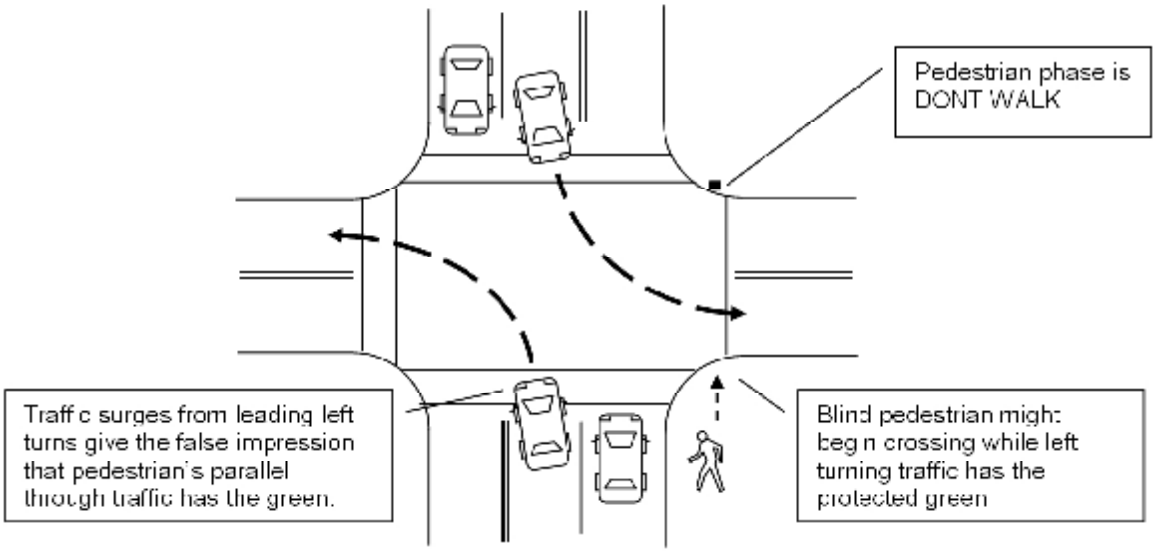

Figure D-11). The moving cars of the leading left-turn phase may also mask the sounds of the parallel through traffic beginning to move, particularly if the protected left-turn interval is followed by a permissive left-turn interval.

Note: Points are *not* given for lagging left-turn phases, which are much better for a blind pedestrian. With a lagging left-turn interval, the through traffic on the parallel street is the first vehicular maneuver after traffic stops on the cross street. The onset of the walk interval usually occurs at the same time and allows all pedestrians, including blind pedestrians to initiate the crossing. The pedestrians are then typically clear of the intersection by the time the lagging left-turn interval begins.

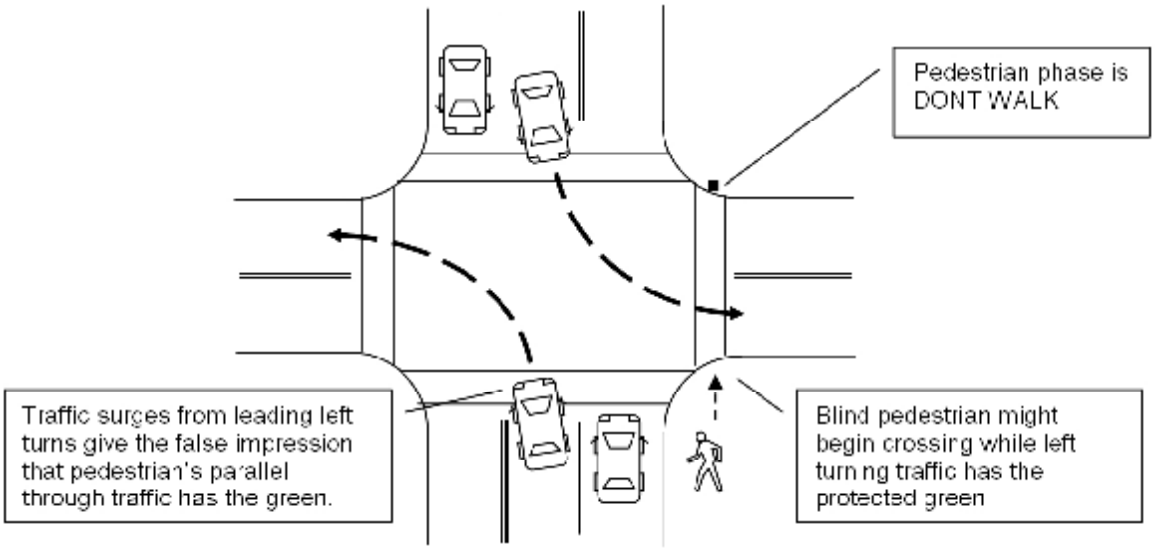

Figure D-11. Leading protected left turns can mislead blind pedestrians.

Protected Right-Turn Only Phase (on Parallel Street)

The surge of traffic by right-turning vehicles using a protected right-turn phase may be incorrectly interpreted as the beginning of the parallel through traffic surge and the simultaneous onset of the walk interval (Figure D-12).

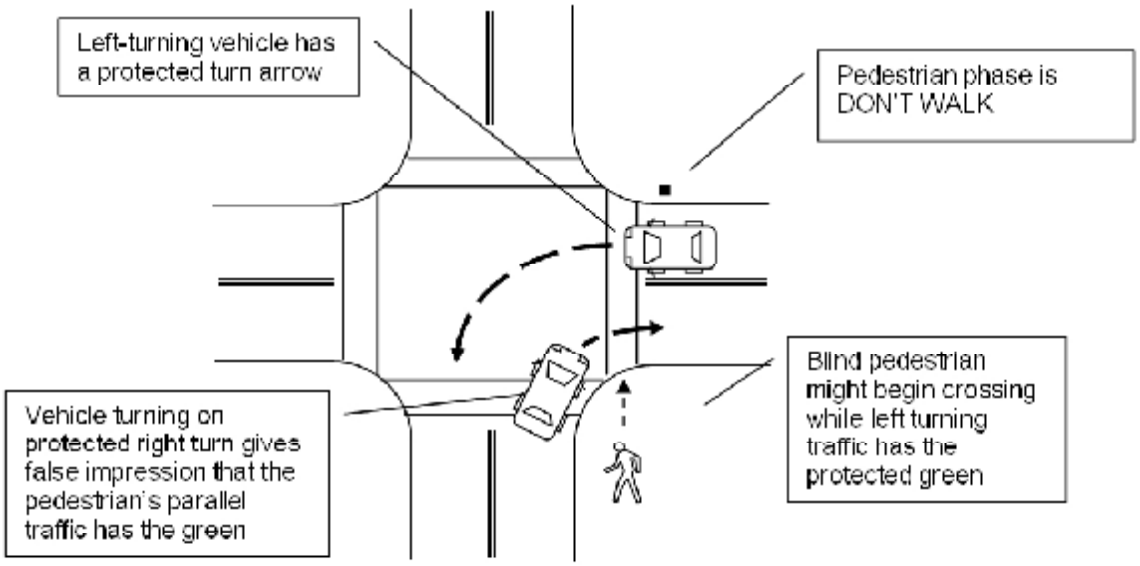

Figure D-12. Protected right turn phase can mislead blind pedestrians.

Channelized Right-Turn Lane under Signal Control

Turning vehicles at channelized turns are typically under yield control. They must stop only if there is traffic approaching intersection the cross street or if a pedestrian is in the crosswalk. However, at some channelized right-turn lanes, vehicles are controlled by a signal that prohibits turns if the signal is red (Figure D-13). Without an audible indication, a blind pedestrian will not know that traffic at the channelized turn lane is under signal control and may attempt to cross when the traffic has a green signal. This confusion of priorities may lead to an unsafe crossing.

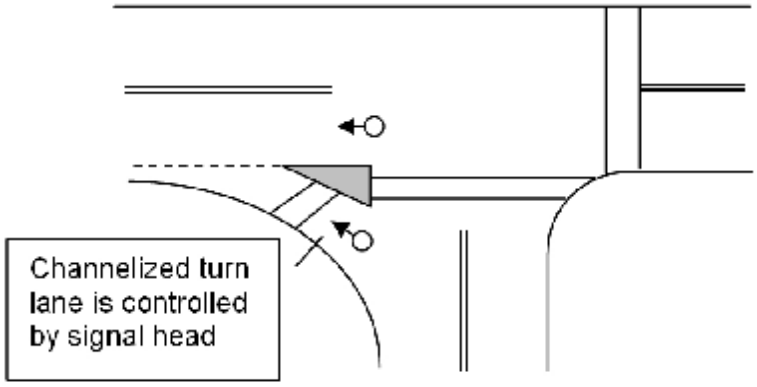

Figure D-13. Channelized turn lane under signal control.

Note: The point values for this factor are for the "signalization" component only. A channelized right-turn lane that is signalized will also receive points under "Channelized right turn island".

Off-Peak Traffic Presence

Traffic volume may impede or assist visually impaired pedestrians. Traffic flow that is very light or erratic (which most often occurs in off-peak periods) makes it difficult to use traffic sound to recognize signal changes. In such cases, audible signals can help to determine the onset of the walk interval. While many municipalities may have turning movement counts or average daily traffic counts, it is not a simple or uniform process to translate these numbers into a meaningful measure for assessing off-peak traffic presence. Instead, this variable is scored on the basis of the proportion of time that at least two vehicles are present at the beginning of a green phase in through lanes that are parallel to the path of the pedestrian.

Note that traffic presence in this category refers to traffic that is parallel to the crosswalk and passes straight through the intersection. If there is no through traffic at the intersection (no lanes continuing straight), there is no reliable traffic available for the blind pedestrian to use as a cue that the walk interval has begun, and the crosswalk would get a rating of "None" and receive the maximum number of points. An example of such a configuration is a T-intersection (Figure D-14).

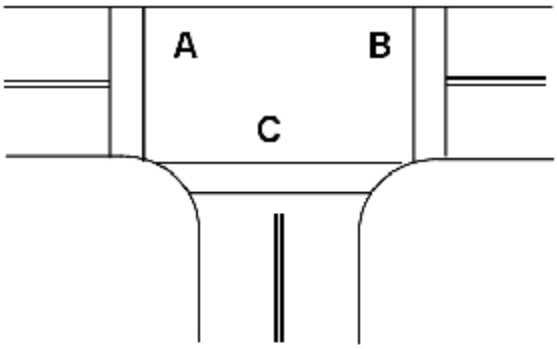

Figure D-14. Crosswalks A and B, across top of the T, at a T-intersection, have no parallel through traffic. In contrast, Crosswalk C has parallel through traffic.

Noting the number of signal cycles with two or more through vehicles over 5 to 10 cycles during the off-peak should be sufficient for determining the percentage for scoring this variable. The levels provided on the worksheet reflect the results that may be acquired in such an exercise.

Distance to Alternative APS Crossing

If there is another signalized crosswalk with APS in close proximity to the intersection being rated, the intersection should receive a lower score (lower priority for APS) than a similar intersection where there is no nearby crossing alternative.

If an alternative accessible crossing is present and scored as such, care must be taken to ensure that the alternative crossing meets the need of the blind traveler by getting them to/from the destination. Just because a crossing is close, it may not always be in a location that helps get the person to their destination. A local orientation and mobility specialist or a pedestrian who has requested an APS can assist with making this determination.

Pedestrian Pushbutton Location (Either Corner)

Section 4E.09 of the MUTCD provides guidance on where pedestrian pushbuttons with APS should be located as follows:

A. Adjacent to a level all-weather surface to provide access from a wheelchair, and where there is an all-weather surface, wheelchair accessible route to the ramp;
B. Within 1.5 m (5 ft) of the crosswalk extended;
C. Within 3 m (10 ft) of the edge of the curb, shoulder, or pavement; and

D. Parallel to the crosswalk to be used. (MUTCD 2003)

The crosswalk worksheet provides for points to be added if the location of pedestrian pushbuttons on either side of a crosswalk does not meet either B or C above. In essence, this variable will give an intersection with poorly located pushbuttons a higher priority for the installation of APS over an intersection with properly located pushbuttons (assuming all other characteristics of the two intersections are the same). Poorly located pushbuttons create much greater difficulty for blind pedestrians in terms of being easily accessible, being positioned in a manner to provide alignment cues, and being located close enough to the curb to be pushed and then cross on the same cycle.

Requests for an APS

Requests for an APS may come from a pedestrian who is visually impaired or from an orientation and mobility professional. These requests are usually very specific—the individual needs to travel from their home to their workplace and needs to cross this street using this crosswalk. Such requests should increase the priority for APS.

Blank Prioritization Tool Worksheets

On the following pages are blank forms that may be reproduced for use in the field when evaluating intersections and crosswalks. There are three separate forms to be used at all intersections—an *intersection worksheet, crosswalk worksheet*, and *supplemental form*—as well as a cover sheet for easy reference of the crosswalk scores.

Prioritization Tool for Installation of Accessible Pedestrian Signals *Cover Sheet*
Location:
Evaluator:
Evaluation Date:

Evaluation Summary Enter total crosswalk score or N/A
Crosswalk A Total Score:
Crosswalk B Total Score:
Crosswalk C Total Score:
Crosswalk D Total Score:
Crosswalk E Total Score:
Crosswalk F Total Score:
Crosswalk G Total Score:
Crosswalk H Total Score:

For each crosswalk, the total score is the intersection score added to the score from the individual crosswalk worksheet.

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2006

Figure D-15. Cover Sheet of APS prioritization tool.

Prioritization Tool for Installation of Accessible Pedestrian Signals, NCHRP 3-62, 2006

Intersection Worksheet

Location:

Sketch: *See instructions for information to include. Label crosswalks as A, B, C, D, etc.*

Indicate North

Configuration (select one)	Points	Score
4-leg	0	
4-leg offset	3	
3-leg (T or Y)	3	
5 or more legs	12	
Midblock location	14	

Signalization* (select one)	Points	Score
Pre-timed	0	
Actuated (semi or fully)	2	
Split phasing	6	
Exclusive ped phase	8	

Transit Facilities within a block (~ 1/8 mile) of the intersection - all legs (select one)	Points	Score
No transit facilities	0	
Single bus route	1	
Multiple bus routes	3	
Transit mall/rail station	5	

Distance to Facility for Visually Impaired (select one)	Points	Score
> 2600 ft (~1/2 mile)	0	
< 2600 ft (~1/2 mile)	4	
< 1300 ft (~1/4 mile)	6	
< 650 ft (~1/8 mile)	8	
< 300 ft	10	

Other Intersection Level Issues

Distance to Major Pedestrian Attraction (select one)	Points	Score
> 2600 ft (~1/2 mile)	0	
< 2600 ft (~1/2 mile)	2	
< 1300 ft (~1/4 mile)	3	
< 650 ft (~1/8 mile)	4	
< 300 ft	5	

*** Select the option with the highest point value that applies to the situation.*

***** The accompanying instructions are essential for accurate completion of this form *****

Intersection Worksheet Score: (sum of scores on this page)

Figure D-16. Intersection worksheet of APS prioritization tool.

Prioritization Tool for Installation of Accessible Pedestrian Signals, NCHRP 3-62, 2006

Crosswalk Worksheet

(Complete one sheet for each crosswalk)

Location: **Crosswalk Label:**

Crosswalk Width (select one)	Points	Score
< 40 ft	0	
40 - 59 ft	1	
60 - 79 ft	2	
80 - 99 ft	3	
100- 119 ft	4	
≥ 120 ft	5	

Posted Speed Limit (select one)	Points	Score
< 20 mph	0	
25 mph	1	
30 mph	2	
35 mph	3	
40 mph	4	
≥ 45 mph	5	

Approach/Crosswalk Geometrics (select all that apply)	Points	Score
Curb radius> 25 ft (either corner)	1	
Islands or medians (painted, raised or cut-through)	1	
Transverse (cross) slope on crosswalk	1	
Apex (diagonal) curb ramp (either corner)	2	
Channelized right turn island	2	
Skewed crosswalk	7	

Pedestrian Signal Control (select all that apply)	Points	Score
Push button actuation required for WALK signal	4	
Non-concurrent WALK interval	4	
Leading Pedestrian Interval (LPI) with parallel street green	8	
Timed for crossing to median island	8	

Vehicle Signal Control (select all that apply)	Points	Score
Right-Turn-On-Red permitted (on parallel street)	2	
Leading protected left-turn phase (on parallel street)	3	
Protected right turn phase / right turn overlap (on parallel street)	7	
Channelized right turn lane under signal control	8	

Off-Peak Traffic Presence - at least 2 vehicles present on parallel street (select one)	Points	Score
Constant (≥ 90 percent of ten cycles)	1	
Heavy (70 - 80 percent)	2	
Moderate (50 – 60 percent)	3	
Light (30 – 40 percent)	4	
Occasional (< 30 percent)	5	
None (i.e., no through lanes present to create surge noise - e.g., stem of T-intersection)	6	

Distance to Alternative APS Crosswalk (select one)	Points	Score
< 300 ft	0	
< 650 ft (~ 1/8 mile)	1	
< 1300 ft (~ 1/4 mile)	2	
< 2600 ft (~ 1/2 mile)	3	
≥ 2600 ft (~ 1/2 mile)	4	

Pedestrian Pushbutton Location - either corner (select all that apply)	Points	Score
Located > 10 ft from curb	3	
Located > 5 ft from the CW extd.	3	

Requests for APS (select one)	Points	Score
No requests	0	
1 or more requests	6	

Other Crosswalk Level Issues

***** The accompanying instructions are essential for accurate completion of this form *****

Crosswalk Worksheet Score: (score from this page)

Intersection Worksheet Score: (score from intersection form)

Total Crosswalk Score: (add the two above scores)

Figure D-17. Crosswalk worksheet of APS prioritization tool.

Prioritization Tool for Installation of Accessible Pedestrian Signals, NCHRP 3-62, 2006

Supplemental Worksheet

Location:

Supplemental Sketch

Supplemental Notes

Figure D-18. Supplemental worksheet of APS prioritization tool.

Examples of Completed Prioritization Tool Worksheets

The following two examples show how the prioritization tool would be used to rate two crosswalks. The first example is a crosswalk that would be relatively easier for pedestrians who are blind or visually impaired. The second example is a crosswalk that would be relatively difficult.

Example Crosswalk 1

This example uses the APS prioritization tool to rate a crosswalk at an intersection in a dense urban area. Both streets of the intersection are fairly narrow and have 35 mph speed limits. The signal is pretimed. Figure 5-1 shows an overhead view of the intersection, with the crosswalk of interest outlined.

Figure D-19. Overhead view of Crosswalk 1 (© Google Earth 2005).

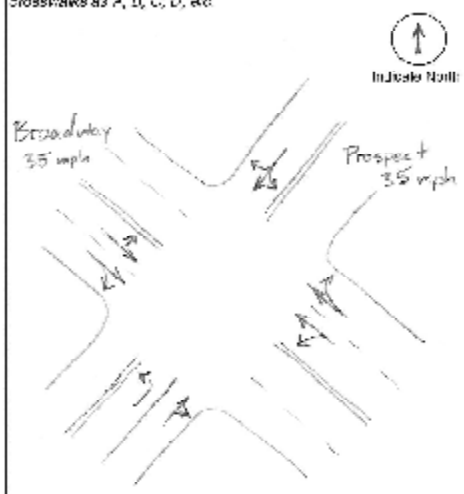
The first worksheet deals with the intersection characteristics (Figure D-20). The total intersection score was zero, since the intersection was a simple four-legged configuration with a pretimed signal and was not located near transit facilities, facilities for the visually impaired, or major pedestrian attractions.

Prioritization Tool for Installation of Accessible Pedestrian Signals, NCHRP 3-62, 2006

Intersection Worksheet

Location: Broadway & Prospect

Sketch: See instructions for information to include. Label crosswalks as A, B, C, D, etc



Configuration (select one)	Points	Score
4-leg	0	0
4-leg offset	4	
3-leg (T or Y)	4	
5 or more legs	12	
Midblock location	14	

Signalization* (select one)**	Points	Score
Pre-timed	0	0
Actuated (semi or fully)	2	
Split phasing	6	
Exclusive ped phase	8	

Transit Facilities within a block (~ 1/8 mile) of the intersection – all legs (select one)	Points	Score
No transit facilities	0	0
Single bus route	1	
Multiple bus routes	3	
Transit mall/station	5	

Distance to Facility for Visually Impaired (select one)	Points	Score
> 2600 ft (~1/2 mile)	0	0
< 2600 ft (~1/2 mile)	4	
< 1300 ft (~1/4 mile)	6	
< 650 ft (~1/8 mile)	8	
< 300 ft	10	

Other Intersection Level Issues

Distance to Major Pedestrian Attraction (select one)	Points	Score
> 2600 ft (~1/2 mile)	0	0
< 2600 ft (~1/2 mile)	2	
< 1300 ft (~1/4 mile)	3	
< 650 ft (~1/8 mile)	4	
< 300 ft	5	

* For intersections only. Signalized midblock locations are accounted for under Configuration.

** Select one option with the highest value that applies to the situation.

** The accompanying instructions are essential for accurate completion of this form **

Intersection Worksheet Score: (sum of scores on this page) 0

Figure D-20. Intersection worksheet for Crosswalk 1.

The second worksheet deals with the crosswalk (Figure D-21). Points were given for the following reasons:

- The crosswalk width is 50 ft. The worksheet range of 40-59 ft earns one point.
- The posted speed limit on Prospect (the street being crossed) is 35 mph. This earns three points.
- The traffic on Broadway (the parallel street) is constant, thereby giving constant audible cues for the pedestrian. This variable earns only one point.
- There is another APS-equipped crosswalk within 0.25 mi. Thus, the crosswalk being rated earns two points in this category.

Prioritization Tool for Installation of Accessible Pedestrian Signals, NCHRP 3-62, 2006

Crosswalk Worksheet

(Complete one sheet for each crosswalk)

Location: Broadway & Prospect | Crosswalk Label: A

Crosswalk Width (select one)	Points	Score
< 40 ft	0	
40 - 59 ft	1	1
60 - 79 ft	2	
80 - 99 ft	3	
100 - 119 ft	4	
≥ 120 ft	5	

Posted Speed Limit (select one)	Points	Score
< 20 mph	0	
25 mph	1	
30 mph	2	
35 mph	3	3
40 mph	4	
≥ 45 mph	5	

Approach/Crosswalk Geometrics (select all that apply)	Points	Score
Curb radius > 25 ft (at the corner)	1	
Islands or medians (painted, raised or cut through)	1	
Transverse (cross) slope on crosswalk	1	
Apex (diagonal) curb ramp (other corner)	2	
Channelized right turn island	2	
Skewed crosswalk	7	

Pedestrian Signal Control (select all that apply)	Points	Score
Push button actuation required for WALK signal	4	
Non-concurrent WALK interval	4	
Leading Pedestrian Interval (LPI) with parallel street green	8	
Timed for crossing to median island	8	

Vehicle Signal Control (select all that apply)	Points	Score
Right-Turn-On-Red permitted (on parallel street)	2	
Leading protected left turn phase (on parallel street)	3	
Protected right turn phase / right turn overlap (on parallel street)	7	
Channelized right turn lane under signal control	8	

Off-Peak Traffic Presence - at least 2 vehicles present on parallel street (select one)	Points	Score
Constant (≥ 90 percent of the cycle)	1	1
Heavy (70 - 80 percent)	2	
Moderate (50 – 60 percent)	3	
Light (30 – 40 percent)	4	
Occasional (< 30 percent)	5	
None (i.e., no through lanes present to create surge noise - e.g., stem of T-intersection)	6	

Distance to Alternative APS Crosswalk (select one)	Points	Score
< 300 ft	0	
< 660 ft (~ 1/8 mile)	1	
< 1320 ft (~ 1/4 mile)	2	2
< 2640 ft (~ 1/2 mile)	3	
≥ 2640 ft (> 1/2 mile)	4	

Pedestrian Pushbutton Location - either corner (select all that apply)	Points	Score
Located > 10 ft from curb	3	
Located > 5 ft from the CW axis	3	

Requests for APS (select one)	Points	Score
No requests	0	0
1 or more requests	6	

Other Crosswalk Level Issues

Crosswalk Worksheet Score: (score from this page)	7
Intersection Worksheet Score: (score from intersection form)	0
Total Crosswalk Score: (add the two above scores)	7

** The accompanying instructions are essential for accurate completion of this form **

Figure D-21. Crosswalk worksheet for Crosswalk 1.

There are no characteristics of this crosswalk that would qualify under the sections for "Approach/Crosswalk Geometrics," "Pedestrian Signal Control," or "Vehicle Signal Control." In addition, the pushbutton poles are located close to the curb and within the crosswalk lines extended and there have been no requests for an APS at this crosswalk; both receive zero points on the prioritization scheme.

The crosswalk worksheet score is seven points. When added to the intersection score of zero points, this yields a total crosswalk score of seven points. In practice, this score of seven points would be compared to other crosswalks under consideration for APS installations. Those crosswalks with the highest scores would have the highest priority for APS.

Example Crosswalk 2

This example rates a crosswalk at a large intersection of a major arterial and a minor side street. The crosswalk of interest is on the east leg (highlighted in Figure D-22; shown at street level in Figure D-23).

Figure D-22. Overhead view of Crosswalk 2 (©Google Earth 2005).

Figure D-23. Street view of Crosswalk 2.

The first worksheet deals with the intersection characteristics (Figure D-24). Points were given for the following reasons:

- The signal is actuated but also uses split phasing, which is a higher point value than actuation, so the intersection gets the six points for split phasing. Split phasing is a less commonly used signal design, and the typically heavy turning movements make it harder to

effectively use the traffic movement cue to determine signal changes. APS would provide a definitive cue to the onset of the walk interval for pedestrians who are unable to see the pedestrian signal.

- There is a single bus route on the main street, which earns another point. The presence of public transit increases the likelihood that visually impaired pedestrians will travel at this intersection, thereby increasing the priority for APS.

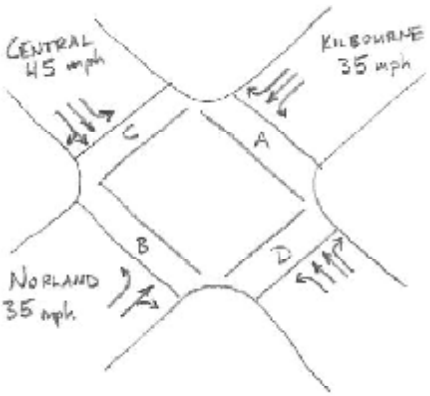
There are no facilities specifically providing services for individuals who are visually impaired or major pedestrian attractors within 0.5 mi, so no points are given for those categories. The total intersection score is seven points.

Intersection Prioritization Tool for Installation of Accessible Pedestrian Signals, NCHRP 3-62, 2005

Intersection Worksheet

Location: CENTRAL & KILBOURNE / NORLAND

Sketch: See instructions for information to include. Label crosswalks as A, B, C, D, etc.



Configuration (select one)	Points	Score
4-leg	0	0
4-leg offset	3	
3-leg (T or Y)	3	
5 or more legs	12	
Midblock location	14	

Signalization* (select one)**	Points	Score
Pre-timed	0	
Actuated (semi or fully)	2	
Split phasing	6	6
Exclusive ped phase	8	

Transit Facilities within a block (~ 1/8 mile) of the intersection - all legs (select one)	Points	Score
No transit facilities	0	
Single bus route	1	1
Multiple bus routes	3	
Transit mall/rail station	6	

Distance to Facility for Visually Impaired (select one)	Points	Score
> 2600 ft (~1/2 mile)	0	0
< 2600 ft (~1/2 mile)	4	
< 1300 ft (~1/4 mile)	6	
< 600 ft (~1/8 mile)	8	
< 300 ft	10	

Other Intersection Level Issues

Split phasing

Distance to Major Pedestrian Attraction (select one)	Points	Score
> 2600 ft (~1/2 mile)	0	0
< 2600 ft (~1/2 mile)	2	
< 1300 ft (~1/4 mile)	3	
< 650 ft (~1/8 mile)	4	
< 300 ft	5	

* For intersections only. Signalized midblock locations are accounted for under Configuration.

** Select the option with the highest point value that applies to the situation.

Intersection Worksheet Score: (sum of scores on this page) 7

Figure D-24. Intersection worksheet for Crosswalk 2.

The second worksheet deals with the crosswalk (Figure D-25). Points were given for the following reasons:

- The crosswalk width of 110 ft and speed limit of 45 mph on the main street earn the crosswalk four and five points, respectively. Wider crosswalks and faster traffic increase the crossing difficulty and risk to visually impaired pedestrians, and an APS may help expedite their crossing.
- The curb radius on one of the corners bordering the crosswalk is greater than 25 ft, so one point is given in the geometrics category. Larger curb radii create orientation problems for visually impaired pedestrians that may be decreased with the use of an APS.

- The signal requires pushbutton actuation for the pedestrian “Walk” signal, so four points are given for the pedestrian signalization category. An APS locator tone would help a pedestrian who is visually impaired recognize that there is a pushbutton at that crosswalk and help in locating the pushbutton.
- Right-turn-on-red (RTOR) is permitted at the crosswalk, so two points are given in the vehicle signal control category. RTOR may produce misleading traffic cues, and an APS would provide a definitive cue of the appropriate time to cross.
- During off-peak hours, there was enough parallel traffic to provide audible cues (two or more vehicles per cycle) about 75% of the time. This earns two points.
- There is not an alternative APS crosswalk within 0.5 mi, so four points are given towards the prioritization of an APS installation at this crosswalk.
- The pedestrian pushbutton at one end of the crosswalk is located more than 10 ft from the curb, which is contrary to the recommendations in Section 4E.09 of the MUTCD. Three points are given for this drawback, since a correctly installed APS would position the push button closer to the curb which facilitates orientation alignment for blind and visually impaired pedestrians.

The crosswalk worksheet score is 25 points. When added to the intersection score of seven points, this yields a total crosswalk score of 32 points. In practice, this score of 32 points would be compared with scores for other crosswalks under consideration for APS installations. Those crosswalks with the highest scores would have the highest priority for APS.

Intersection Prioritization Tool for Installation of Accessible Pedestrian Signals, NCHRP 3-62, 2006

Crossing Worksheet

(Complete one sheet for each crossing)

Location: CENTRAL & KIRKBURNE / NORLAND **Crosswalk Label:** D

Crossing Width (select one)	Points	Score
< 40 ft	0	
40 - 59 ft	1	
60 - 79 ft	2	
80 - 99 ft	3	
100- 119 ft	4	4
≥ 120 ft	5	

Speed Limit (select one)	Points	Score
< 20 mph	0	
25 mph	1	
30 mph	2	
35 mph	3	
40 mph	4	
≥ 45 mph	5	5

Approach/Crossing Geometries (select all that apply)	Points	Score
Skewed crossing	7	
Curb radius > 25 ft (either corner)	1	1
Apex curb ramp (either corner)	2	
Channelized right turn island	2	
Islands or medians (painted, raised or cut-through)	1	
Transverse slope on crosswalk	1	

Pedestrian Signal Control (select all that apply)	Points	Score
Timed for crossing to median crossing island	6	
Push button actuation required for WALK signal	4	4
Leading Pedestrian Interval (LPI) with parallel street green	8	
Non-concurrent WALK interval	4	

Vehicle Signal Control (select all that apply)	Points	Score
Protected right turn phase / right turn overlap (on parallel street)	7	
Leading protected left-turn phase (on parallel street)	3	
Right-Turn-On-Red permitted (on parallel street)	2	2
Channelized right turn lane under signal control	5	

Off-Peak Traffic Presence - at least 2 vehicles present on parallel street (select one)	Points	Score
Constant (> 90 percent of cycles)	1	
Heavy (70 - 80 percent)	2	2
Moderate (50 – 60 percent)	3	
Light (30 – 40 percent)	4	
Occasional (< 30 percent)	5	
None (i.e., no through lanes present to create surge noise - e.g., stem of T-intersection)	6	

Distance to Alternative APS Crossing (select one)	Points	Score
< 300 ft	0	
< 650 ft (~ 1/8 mile)	1	
< 1300 ft (~ 1/4 mile)	2	
< 2600 ft (~ 1/2 mile)	3	
> 2600 ft (~ 1/2 mile)	4	4

Pedestrian Pushbutton Location - either corner (select all that apply)	Points	Score
Located > 10 ft from curb	3	3
Located > 5 ft from the CW extd.	3	

Requests for APS (select one)	Points	Score
No requests	0	0
1 or more requests	6	

Other Crossing Level Issues

Crossing Worksheet Score: (score from this page)	25
Intersection Worksheet Score: (score from intersection form)	7
Total Crossing Score: (add the two above scores)	32

Figure D-25. Crosswalk worksheet for Crosswalk 2.

References

Manual on Uniform Traffic Control Devices, 2003 Edition, (with Revision No. 1 incorporated), Federal Highway Administration, Washington, DC, November 2004.