Champaign-Urbana Pedestrian Crossing Enhancement Guidelines

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CHAMPAIGN COUNTY REGIONAL PLANNING COMMISSION

CUUATS

This document was developed for the member agencies of the Champaign-Urbana Urbanized Area Transportation Study (CUUATS), a program of the Champaign County Regional Planning Commission (CCRPC).

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Cover Photos (left to right, top to bottom): University Avenue at Walnut Street in Downtown Champaign; Broadway Avenue at Walnut Street in Downtown Urbana; Denton Drive at Church Street in Savoy; and Windsor Road at Vine Street in Urbana.

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1 Introduction

Pedestrian Crossing Needs

Pedestrians are legitimate users of the transportation system, and they should, therefore, be able to use this system safely.

The decision to walk usually takes into account the distance of the trip, the perceived safety of the route, and the comfort and convenience of walking versus an alternative mode.

In pedestrian-friendly cities, crossing locations are treated as essential links in the pedestrian network. The Champaign-Urbana region should strive to create a convenient, connective, and continuous walking environment.

Transportation engineers, planners, and designers all share a responsibility to find ways for vehicles, pedestrians, and bicyclists to coexist conveniently and safely.

At a starting point, roads should be designed with the premise that there will be pedestrians, that they must be able to cross the street, and that they must be able to do it safely. The design question is, "How can this task best be accomplished?"

Marked crosswalks are only one of multiple tools to achieve this task, as discussed further in Chapters 2 and 3. Marking crosswalks serve two purposes:

1. They tell the pedestrian the best place to cross
2. They clarify that a legal crosswalk exists at a particular location

Previous Crosswalk Standards

From 2000 to 2013, staff from the Champaign-Urbana Urbanized Area Transportation Study (CUUATS) were also staff for the Campus Area Transportation Study (CATS). The member agencies of CATS included the City of Champaign, City of Urbana, University of Illinois, and Champaign-Urbana Mass Transit District (CUMTD).

As part of CATS work, the University District Crosswalk Markings and Signage guidelines was developed in 2007 and updated annually until 2011 (see Figure 1). However, there have never been any crosswalk guidelines developed for the greater Champaign-Urbana community.

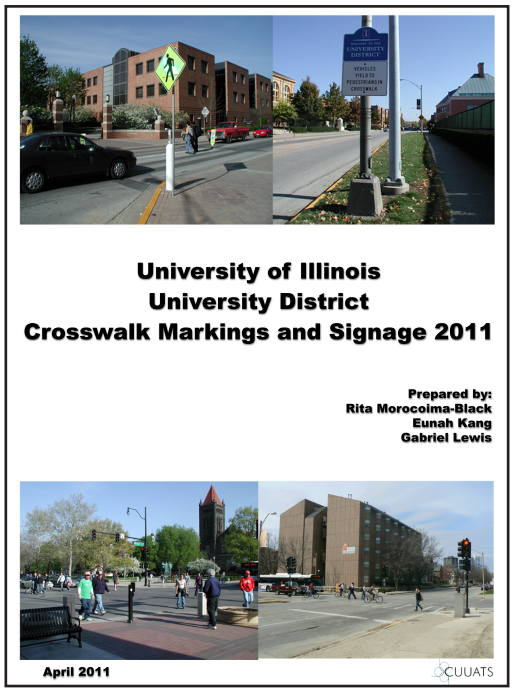


Figure 1: University District Crosswalk Markings and Signage Guidebook 2011 Cover

Current Crosswalk Request Procedures

Marked crosswalk installation requests are analyzed on a case by case basis by the City of Champaign, City of Urbana, University of Illinois, and/or CUUATS, depending on the location of the request. These requests are made by residents and employees in the Champaign-Urbana area.

In Urbana, public requests for marked crosswalks are submitted to Urbana Public Works (UPW). The requestor is asked to fill out a Traffic Issues/Concerns Request (TICR) form. UPW staff reviews the TICR form to determine if a study is needed, and if so, conducts the study to determine the level of improvement needed for the location in question. The completed study with recommendation(s) is presented to the Urbana Traffic Commission for consideration, at which point public comment can be made.

Crosswalk Installation & Safety

Of all road users, pedestrians have the highest risk of being in a crash with a vehicle because they are the least protected.

A 2005 Federal Highway Administration (FHWA) study analyzed pedestrian safety at 1,000 marked and 1,000 unmarked crosswalks at uncontrolled locations across the United States. An uncontrolled location is an intersection without a traffic signal or all-way stop.

According to that study, there was no significant difference in pedestrian crash rates at marked versus unmarked crossings under the following conditions:

- Two-lane roads
- Multi-lane roads without raised medians and with Average Daily Traffic (ADT) counts below 12,000
- Multi-lane roads with raised medians and with ADTs below 15,000

For multi-lane roads with ADTs above these values, there was a significant increase in pedestrian crashes on roads with marked crosswalks, compared to roads with unmarked crosswalks.

Therefore, striping a crosswalk at a location without appropriate enhancements can create a false sense of security for pedestrians, yet can decrease pedestrian safety in reality. Such a crosswalk installation could make it less safe for pedestrians than if it had either no treatment or a higher level of treatment.

Crosswalks & Vulnerable Populations

The 2005 FHWA study found that a greater percentage of older adults and young children chose to cross in marked crosswalks on multi-lane roads compared to two-lane roads. Thus, installing a marked crosswalk at an already undesirable crossing location (e.g., wide, high-volume street) may increase the chance of a pedestrian crash occurring at such a site if a few at-risk pedestrians are encouraged to cross where other adequate crossing facilities are not provided.

This explanation might be evidenced in cities nationwide by the many calls to traffic engineers from citizens who state, "Please install a marked crosswalk so that we can cross the dangerous street near our house." Unfortunately, simply installing a marked crosswalk without other more substantial crossing facilities often does not result in the majority of motorists stopping and yielding to pedestrians, contrary to the expectations of many pedestrians.

Community Crosswalk Standards

A mechanism is needed to evaluate proposals for new crosswalks or changes to existing crosswalks that is consistent across all jurisdictions in the urbanized area. These guidelines aim to standardize and fairly determine warrants for installation of pedestrian crossing improvements.

This document is intended to serve as a reference guide for CUUATS member agency staff, citizens, and developers when determining the best engineering solutions to pedestrian safety concerns, particularly with regard to the location and design of crosswalks, pedestrian signals, and other elements of pedestrian safety.

Benefiting Agencies

This document is intended to benefit the staff, residents, and employees of all CUUATS member agency jurisdictions.

This document is intended to assist staff from the City of Champaign, City of Urbana, Village of Savoy, University of Illinois at Urbana-Champaign (UIUC), Champaign County (in unincorporated urban areas), and the Illinois Department of Transportation (IDOT) in addressing pedestrian safety issues, as well as public requests for pedestrian crossing improvements.

This document is also intended to help staff and users of the Champaign-Urbana Mass Transit District (CUMTD) improve access to and from bus stops, which are often located at intersections or other pedestrian crossing locations.

This document can also help the Champaign County Forest Preserve District (CCFPD), as pedestrians and bicyclists along its soon to be opened Kickapoo Rail Trail will cross roads between Urbana and points east to Kickapoo State Park.

The Champaign and Urbana Park Districts will also indirectly benefit from these guidelines with improved pedestrian access to parks, where many residents and visitors go to walk and bike away from the roads of the urban environment.

2 Crossing Treatment Toolbox

This chapter groups the pedestrian (and bicycle) crossing features that are or could be used in the Champaign-Urbana area into four categories:

1. Pavement Markings
2. Signage
3. Hardscape (i.e. physical infrastructure)
4. Lights and Signals

These summaries reflect the more common treatments being used and do not include every device or treatment available. This selection of pedestrian crossing treatments is not necessarily an all-inclusive list, nor is it intended to be. Local engineers and planners should stay abreast of new and improved pedestrian crossing treatments.

Consideration for pedestrian crossing treatments must always include pedestrians with disabilities, and proper accommodations must be provided to meet Americans with Disabilities Act (ADA) requirements.

Crosswalk Definition

Crosswalks serve as the pedestrian right-of-way across a street and thus should be designed to offer as much comfort and protection as possible. The definition of an intersection crosswalk is the extension of a sidewalk across an intersection.

Crosswalks are generally defined as the portion of the roadway designated for pedestrians to use in crossing the street. Crosswalks exist at the intersection of roadways regardless of whether they are marked or unmarked (see below).

Every intersection, and certain midblock locations, are legal crosswalks in Illinois, unless otherwise signed.

Unmarked Crosswalks

All intersections of streets with pedestrian facilities are considered unmarked crosswalks. Pedestrians are legally allowed to cross at unmarked crosswalks, unless otherwised signed.

Pavement Markings

Marked Crosswalks

Definition

Marked crosswalks use pavement markings on the street to indicate preferred locations for pedestrians to cross and help motorists identify areas to look for pedestrians. Marked crosswalks may occur at intersections or mid-block locations.

Marked crosswalks inform motorists of the location of a pedestrian crossing, allowing them time to lawfully stop for a crossing pedestrian; and also assure the pedestrian of the existence of a legal crosswalk at a particular location. To effectively communicate this, the crosswalk design must be easily understood, clearly visible, and incorporate realistic crossing opportunities for all pedestrians.

Installation Location Guidance

Crosswalks at traffic signals should be marked. Crosswalks at intersections controlled by an all-way stop can also be marked.

As a general rule, member agencies should not mark crosswalks on low-volume, two-lane streets. A 2005 FHWA crosswalk study shows that there is no safety benefit for crosswalk markings on this type of street.

The major exception to this general rule is marking crosswalks on low-volume, two-lane street intersections near schools and at school crossing locations, especially when adult crossing guards are stationed there.

Crosswalk markings should not be used at all intersections. At uncontrolled pedestrian crossing locations, installing marked crosswalks should not be regarded as a magic cure for pedestrian safety problems.

The spacing of marked crosswalks should also be considered so that they are not placed too close together. Overuse of marked crosswalks may breed

driver disrespect for them, and a more conservative use of crosswalks generally is preferred.

As with any installation of traffic control devices, the most essential tool for marked crosswalk installation is the use of engineering judgment. Engineering judgment should be used, and if possible, an engineering study performed when considering the marking of crosswalks. See Chapter 3 for more information.

Types

Crosswalk marking types are classified based on the system used by FHWA (see Figure 2). The two primary crosswalk types striped in the Champaign-Urbana area are:

- **Standard (or Parallel)** – A crosswalk marked by solid lines at its outer edges (see Figure 3).
- **Continental** – A crosswalk marked by wide stripes perpendicular to the direction of travel, or parallel to the curb (see Figure 4).

Additionally, the Manual on Uniform Traffic Control Devices (MUTCD) Figure 3B-20 illustrates this type of crosswalk used for an exclusive pedestrian phase:

- **Box for Exclusive Period** – A painted marking indicating that, during the appropriate signal phase, pedestrians can cross the intersection in any direction.

These crosswalk types are preferred because they are more visible to approaching vehicles and have been shown to improve yielding behavior, especially continental crosswalks.

Dimensions & Details

• Marked crosswalks should be at least 6' wide, though they can be 10' or wider in high pedestrian areas in the University District, Downtown Champaign, or Downtown Urbana.

• Standard crosswalk lines consist of solid lines no less than 6" wide and no greater than 2' wide, located at least 6 feet apart.

• Continental crosswalk lines should be 1' wide, spaced 2' apart (see Figure 6), and should avoid vehicle wheel paths if possible.

• Crosswalk lines should extend the full length of crossing.

• According to the MUTCD, all crosswalk markings should be white.

• Durable crosswalk marking materials may be preferable to paint at some locations because of durability and cost-effectiveness.

Figure 2: Marked Crosswalk Types (FHWA)

Figure 3: Standard or Parallel Crosswalk

Figure 4: Continental Crosswalk

Figure 5: Box for Exclusive Period

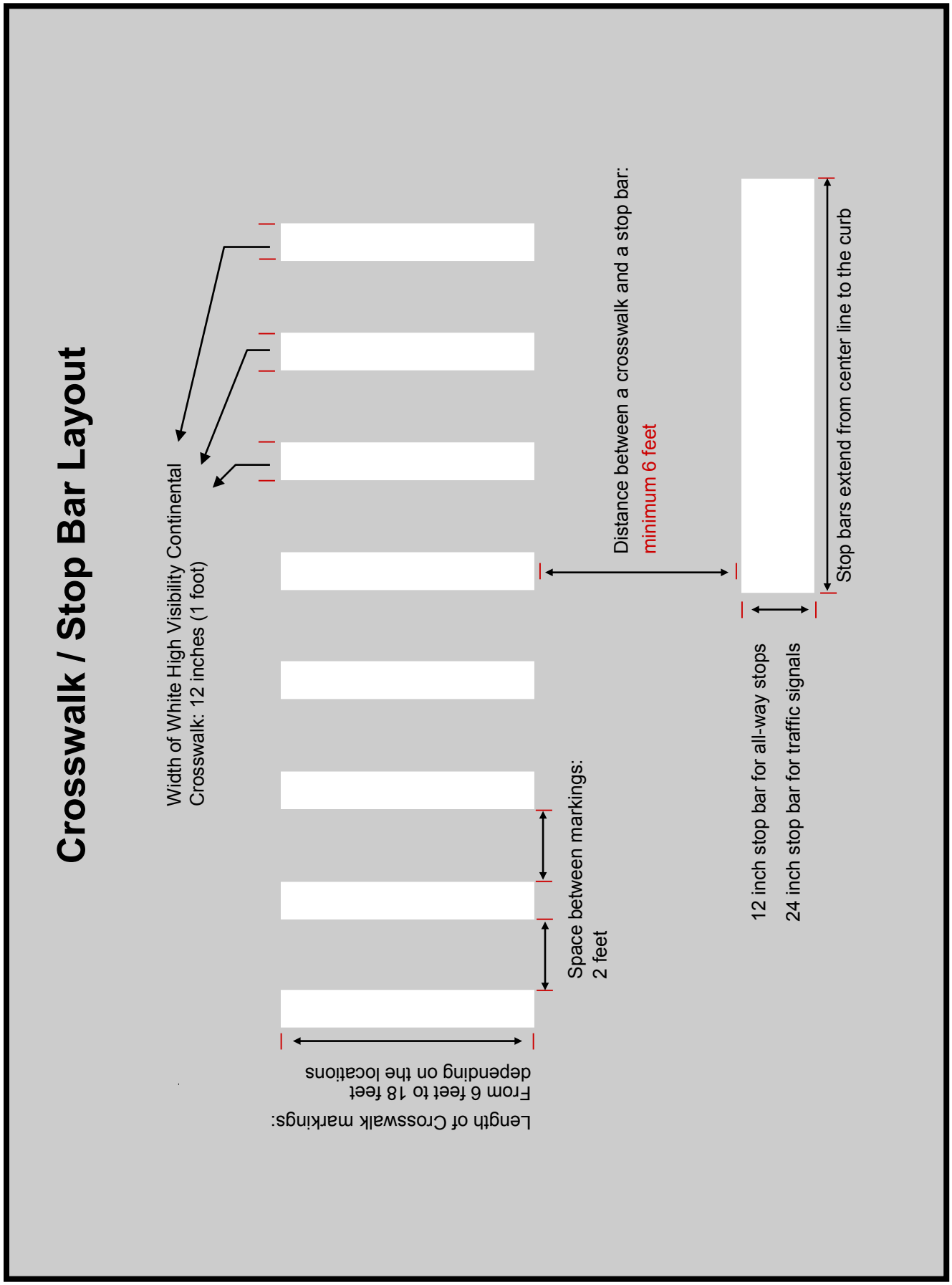


Figure 6: Continental Crosswalk and Stop Bar Layout

Stop Bars

Stop bars are solid line pavement markings extending across a travel lane that dictate where a motorist should initially stop. This is the place motorists should look for and stop for pedestrians.

Stop bars may be used to indicate the point behind which vehicles are required to stop in compliance with a STOP (MUTCD R1-1) sign or a Stop Here for Pedestrians (R1-5b) sign.

Stop bars can be placed at intersections with stop control (e.g. traffic signals, stop signs). Stop bars shall be striped a minimum of 6 feet from the edge of the crosswalk at these locations. Stop bars shall be 1 foot wide at all-way stop intersections, and 2 feet wide at intersections with traffic signals. See Figures 6 and 8.

Stop bars shall be placed at uncontrolled intersections and mid-block crosswalks where Stop Here for Pedestrians (R1-5b) signs are located (see Figure 7). Stop bars shall be striped a minimum of 25 feet from the edge of the crosswalk at these locations. Parking should be prohibited in the area between the stop bar and the crosswalk.

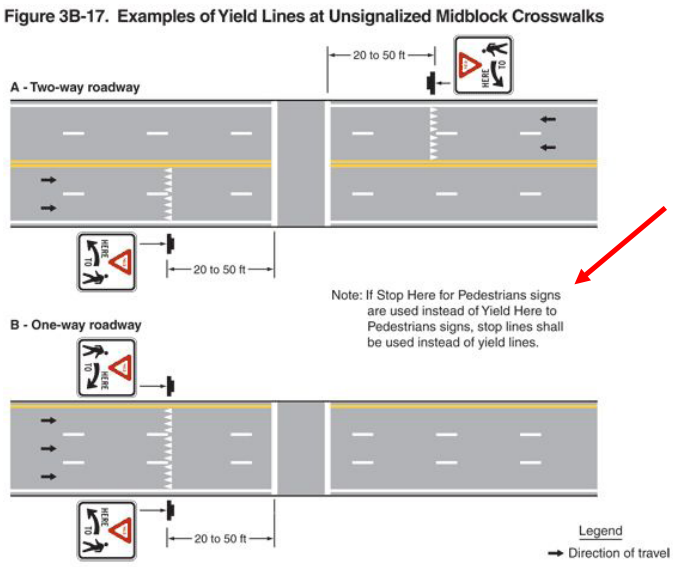


Figure 7: Examples of Stop Bars at Unsignalized Midblock Crosswalks (source: MUTCD)

**Refer to the text above for specific recommendations to follow.*

Bike Crossings

In the University District, bike crossings are striped where off-street bike paths cross streets.

Bike crossings should use two standard white parallel lines with a bicycle stencil marked in the center of the section (see Figure 8).

Bike crossings should be striped at the following locations in the University District:

1. Dorner Drive across Gregory Drive (east leg)
2. Mathews Avenue across Green Street (east leg)
3. Mathews Avenue across Gregory Drive
4. Mid-block between Green Street and Oregon Street across Mathews Avenue
5. Mid-block between Nevada Street and Gregory Drive across Goodwin Avenue
6. Sixth Street at Lorado Taft Drive (north and east legs)
7. Virginia Drive across Pennsylvania Avenue

Trail Crossings

Where trails, or shared-use paths, used by pedestrians and bicyclists cross roads at mid-block locations, use continental crosswalk markings with a minimum 9 feet wide markings. Trail crossing signs should also be installed (see below).

Trail crossings should be striped at the following locations in the University District:

1. Boneyard Trail across Fourth Street
2. Boneyard Trail across Fifth Street
3. Boneyard Trail across Mathews Avenue
4. Boneyard Trail across Goodwin Avenue

Trail crossings should also be installed at future crossings of the Kickapoo Rail Trail.

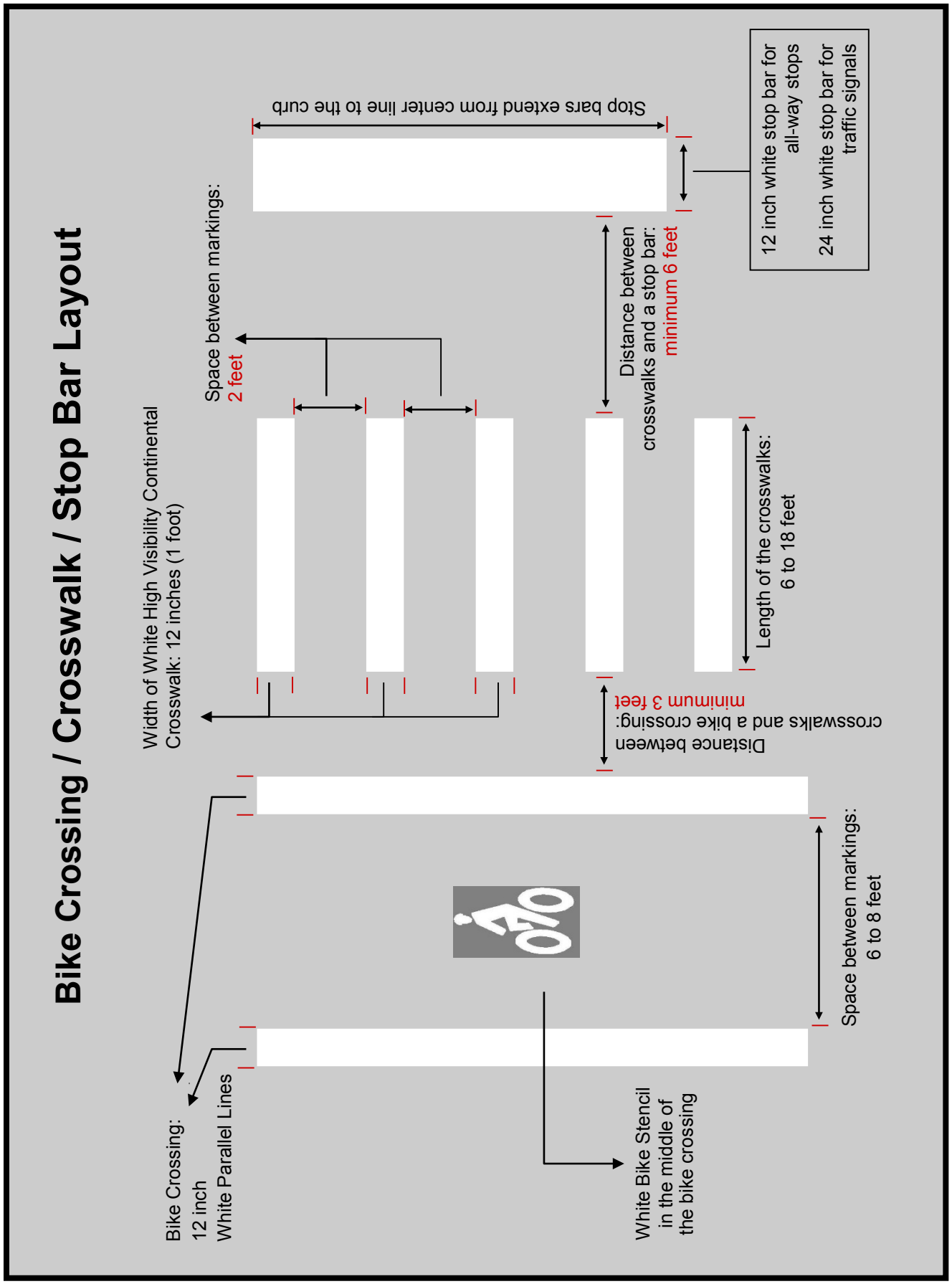


Figure 8: Bike Crossing, Crosswalk, and Stop Bar Layout

Signage

Pedestrian Crossing Signs

A pedestrian warning sign (W11-2) is a diamond-shaped sign, which warns drivers to look out for pedestrians.

Pedestrian crossing warning signs should always be installed in advance of mid-block crossings (W16-9p; see Figure 9).

They alert road users of a pedestrian crossing point across roadways not controlled by signals or Stop signs. At non-intersection locations, markings legally establish the crosswalk. Wherever the crosswalk is striped, the W11-2 sign should be installed with a diagonal downward facing arrow plaque under it (W16-7p; see Figure 10).

On major corridors like Lincoln Avenue, stop bar markings are not used; instead advance pedestrian warning signs are installed at the beginning of the road where pedestrians are expected, and pedestrian crossing warning signs are installed at each unsignalized approach to an intersection.

Figure 9: Pedestrian Crossing Ahead Sign

Figure 10: Pedestrian Crosswalk Sign

In-Street Pedestrian Crossing Signs

In-street pedestrian crossing signs (R1-6; see Figure 11) can also be used at crosswalk locations to remind road users of the state law to stop for pedestrians in the crosswalk at an unsignalized pedestrian crossing. These signs can make the crosswalk more visible and increase driver compliance. They are more likely to be effective on two-lane, low-speed streets than on multi-lane, high-speed streets.

In-street pedestrian crossing signs have been replaced over time in the University District in Champaign-Urbana with measures to shorten the pedestrian crossing distance, such as roadway narrowing and curb extensions. However, if these signs are installed in the future in the Champaign-Urbana area, they should only be installed at unsignalized locations on a concrete island where an island is available. The signs should be placed in front of the crosswalk instead of the center of the crosswalk. Double-backed signs should be installed, so that drivers can read the sign from both directions of the road. A "gateway" placement of these signs has the best safety effect, by placing a sign on the centerline, on each lane line, and at the curbs (see Figure 12).

Figure 11: In-Street Pedestrian Crossing Sign

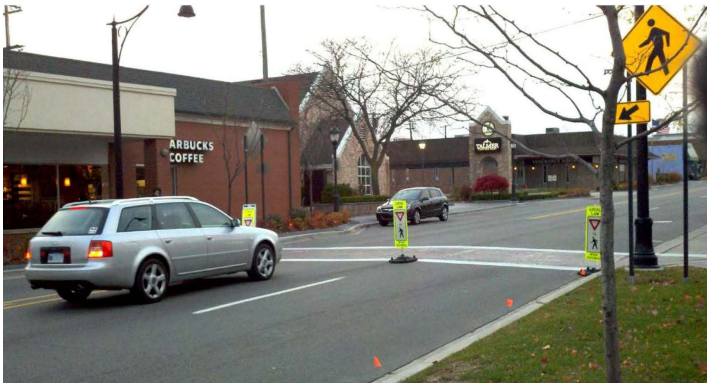


Figure 12: Gateway placement of In-Street Pedestrian Crossing Signs in Michigan (Source: Roadway Safety Institute)

Stop Here for Pedestrians Signs

The Stop Here for Pedestrians sign (R1-5b; see Figure 13) is a square sign used at mid-block marked crosswalks. The sign should be installed in the parkway next to a stop bar a minimum of 25 feet from the edge of the crosswalk. These signs should only be installed in the Champaign-Urbana area with a white background.

Figure 13: Stop Here for Pedestrians Sign

Trail Crossing Signs

Shared-use trails should be signed at cross streets and vice versa so trail users know where they are and motorists recognize that they are crossing a trail. The Combination Bike and Pedestrian Crossing sign (W11-15; see Figure 14) should be used on all roads where they cross shared-use trails.

A Trail Crossing plaque (W11-15P; see Figure 15) should be mounted below the Combination Bike and Pedestrian Crossing sign ahead of the crossing.

An "Ahead" plaque (W16-7P; see Figure 16) can also be mounted below the two aforementioned signs ahead of the crossing.

A diagonal arrow plaque (W16-9P; see Figure 17) should be mounted below the Combination Bike and Pedestrian Crossing sign at the trail crossing.

Figure 14: Combination Bike and Pedestrian Crossing Sign

Figure 15: Trail Crossing Sign

Figure 16: Ahead Sign

Figure 17: Diagonal Arrow Sign

Hardscape

Sidewalks

Pedestrian crossings should be connected to sidewalks via curb ramps. Sidewalks are the primary circulation routes for pedestrians. Pedestrian-friendly neighborhood street design improves the safety of the walking environment, fosters trips made on foot, and facilitates better access to transit service provided in the community.

Pedestrians primarily use sidewalks and they should be accessible to all users. It is important that sidewalks be provided extensively throughout the transportation network to provide pedestrians with a safe place to travel. It should be noted that all bicyclists who choose to travel on sidewalks have the same rights as pedestrians, except where prohibited, and must yield to pedestrians.

Figure 18: Sidewalk and Curb Ramps with truncated domes

Curb Ramps

Curb ramps are transitions between the sidewalk and the street. They provide street and sidewalk access to pedestrians using wheelchairs. Dual ramps (see Figure 18) are desirable to direct pedestrians to the correct alignment of the crosswalk, and where possible, opposing curb ramps should align. Curb ramps should also have a detectable warning surface.

Median Refuge Islands

A median refuge island is a concrete island in the middle of a roadway that allows pedestrians and bicyclists to cross one direction of traffic at a time. Refuge islands are primarily installed on roads where cross-traffic does not stop.

Typically, refuge islands include crosswalk markings on either side of the island, and are oriented at an angle so that the person(s) crossing must look at the approaching traffic before crossing (see Figure 19). Refuge islands should be clear of obstructions and have adequate drainage.

The presence of a raised median or raised crossing island is associated with a significantly lower pedestrian crash rate at multilane sites with both marked and unmarked crosswalks.

Dimensions

- The desired width of a refuge island is 10', in order to accommodate a bicycle with a trailer.
- The minimum width of a refuge island should not be less than 6'.
- The opening in the refuge island should be wide enough to accommodate two-way bicycle traffic.
- Detectable warning surfaces should be installed at the edges of the sidewalks and the refuge island.

Engineering

Refuge islands should be designed in accordance with the *Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)* and the proposed *Public Rights-of-Way Accessibility Guidelines* (PROWAG).

Markings

- High visibility continental crosswalk markings should be installed on both sides of the refuge island.
- Advance stop lines may be apprporiate to install on the cross street ahead of the refuge island where the users crossing are given priority.

Signage

Follow the recommendations in "Trail Crossing Signs" previously discussed.

Figure 19: Refuge island across Main Street in Downtown Urbana

Traffic Calming

Other physical infrastructure changes can be made to streets to shorten pedestrian crossing distances, thus reducing pedestrian exposure to vehicles.

Curb extensions, or bump outs, are used at some crosswalks to shorten crossing distance, increase pedestrian visibility, and improve safety at a crossing. Bump outs are often used in areas with on-street parking, where the curb is extended to a distance approximately equal to the width of a parking lane. The street narrowing caused by this device can make motorists uncomfortable, causing them to choose lower speeds.

Roadway narrowing can be used to lower vehicle speeds and increase safety in pedestrian crossing areas. Narrowing can occur at selected locations along a corridor, or over the entire corridor itself. The physical and visual characteristics of the roadway narrowing encourage drivers to reduce their speeds, which can facilitate pedestrian crossings in the area. Roadway narrowing also improves the visibility of both the pedestrian crossing signs and the pedestrians themselves to the drivers. Road narrowing must consider truck volumes and access for school buses, transit buses, and emergency vehicles.

Figure 20: Curb extension on Park Street in Downtown Champaign

Lights & Signals

Rectangular Rapid Flashing Beacon (RRFB)

Rectangular rapid flashing beacons (RRFB) are active warning devices used to alert motorists of crossing pedestrians at uncontrolled crossings (see Figure 21). They remain dark until activated by pedestrians via pushbutton (see Figure 22), at which point they emit a bright, rapidly flashing yellow light. RRFBs are warning devices and do not themselves create a legal requirement for a vehicle to stop when they are flashing.

RRFBs are currently located in Urbana on Windsor Road at Vine Street, as well as Springfield Avenue by the Grainger Engineering Library.

Figure 21: RRFB light flashing on Windor Road at Vine Street

Figure 22: RRFB Pushbutton

Pedestrian Hybrid Beacon (HAWK Signal)

The pedestrian hybrid beacon, also known as a High-intensity Activated crossWalK (or HAWK) beacon or signal, is a pedestrian activated regulatory device located on the roadside or on mast arms over midblock pedestrian crossings. The beacon head consists of two red lenses above a single yellow lens. The beacon head is "dark" until the pedestrian wishes to cross the street. At this point, the pedestrian pushes a button that activates the beacon. After displaying brief flashing and steady yellow intervals (during which cars must stop), the device displays a steady red indication to drivers and a "WALK" indication to pedestrians, allowing them to cross a major roadway while traffic is stopped. After the pedestrian phase ends, the "WALK" indication changes to a flashing orange hand to notify pedestrians the walk phase has ended and not to enter the crossing. The hybrid beacon displays alternating flashing red lights to drivers while pedestrians finish their crossings before once again going dark at the conclusion of the cycle. The beacon is a hybrid between a pedestrian traffic signal and a stop sign.

There is a HAWK Signal on Bradley Avenue near the Developmental Services Center (see Figure 23) in Champaign.

Figure 23: HAWK Signal on Bradley Avenue at the Developmental Services Center

Traffic Signal

The traditional tri-colored traffic signal is typically found at intersections, but can be used at mid-block crossings when traffic volumes warrant it.

The investigation of the need for a traffic signal for pedestrians is described in MUTCD Warrant 4. An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a

traffic control signal is justified at a particular location. This warrant shall not be applied at locations where the distance to the nearest traffic signal is less than 300 feet, unless the proposed signal will not restrict the progressive movement of vehicle traffic.

The following are features related to traffic signals that can improve pedestrian crossings:

Pedestrian Countdown Signals

Pedestrian countdown signals (or timers) consist of a standard pedestrian signal head, with an added display showing a countdown of the remaining crossing time (see Figure 24). Specifically, these signals inform pedestrians of the number of seconds remaining in the pedestrian change interval. They indicate whether a pedestrian has time to cross the street before the signal phase ends.

Figure 24: Pedestrian countdown signal at Fourth and Green Streets

Countdown signals are required by the MUTCD to be installed whenever pedestrian signal heads are warranted as part of intersection signalization or reconstruction. Signals may be supplemented with audible or other messages to make crossing information accessible for all pedestrians.

Leading Pedestrian Interval (LPI)

Also known as "advance pedestrian phase," a leading pedestrian interval phase gives pedestrians an advance walk signal before motorists get a green signal, giving the pedestrian several seconds to start walking in the crosswalk before a concurrent signal is provided to vehicles. This makes pedestrians more visible to motorists and motorists more likely to stop for them. Typical settings provide 3 to 6 seconds of advance walk time.

Pedestrian Scramble Phase

A pedestrian scramble, also known as a diagonal crossing or Barnes dance, is a pedestrian crossing system that stops all vehicular traffic and allows pedestrians to cross an intersection in every direction, including diagonally, at the same time (see Figure 25).

Figure 25: Pedestrian Scramble Phase at Green & Wright Streets

The "Box for Exclusive Period" pavement markings are used at these locations.

Four locations in Champaign-Urbana currently have pedestrian scramble phases:

1. Green Street at Goodwin Avenue
2. Green Street at Wright Street
3. Green Street at Sixth Street
4. Gregory Drive at Fourth Street

Flashing Lights

Flashing lights supplement warning signs at unsignalized intersections or mid-block crosswalks to increase pedestrian crossing visibility for motorists (see Figure 26).

Street Lighting

Street lighting can be installed at a pedestrian crossing to help approaching motorists see a crossing pedestrian. Crosswalk lighting should be at a "vehicular scale" like normal street lighting rather than a "pedestrian scale" that is often used along a sidewalk, to increase the ability of motorists to detect pedestrians.

The 2005 FHWA crosswalk study found that adequate nighttime lighting should be provided at marked crosswalks to enhance the safety of pedestrians crossing at night.

Figure 26: Flashing lights and crosswalk across Church Street in Savoy

3 Crossing Treatment Decision

The authors of the 2005 FHWA crosswalk study note that:

> "When considering marked crosswalks at uncontrolled locations, the question should not simply be: 'Should I provide a marked crosswalk or not?' Instead, the question should be: 'Is this an appropriate tool for getting pedestrians across the street?"

This is why this document is titled "Pedestrian Crossing Enhancement Guidelines" instead of just "Crosswalk Guidelines."

Marked crosswalks are one tool used to direct pedestrians safely across a street. In most cases, marked crosswalks are best used in combination with other treatments discussed in Chapter 2 (e.g. median refuge islands, curb extensions, traffic signals, street lighting).

In general, roadways with more travel lanes, higher speeds, and a greater number of people driving, walking, and biking need extra elements to meet safety standards. Intersection design is also extremely important for the safety of pedestrians.

This document should serve as guidance for retrofit crosswalk marking installations, as well as installations at new and future construction projects.

Best Practices

Signalized Intersections

- Mark crosswalks on all approaches with curb ramps, unless safety or signal-phasing concerns suggest otherwise.
- The MUTCD lists a walking speed of 4 feet per second for calculating pedestrian clearance intervals for traffic signals. However, NCHRP 562 recommends using pedestrian walking speeds of 3.5 feet per second for the general population, and 3 feet per second for the older and less able population when planning pedestrian crossing improvements.
- Pedestrian countdown signals are useful at locations with crossing distances greater than 60 feet and pedestrian clearance intervals of greater than 15 seconds or a high pedestrian volume.
- Especially at skewed intersections, marked crosswalks need to be kept close to the turning traffic so that pedestrians stay within the driver's line of sight. If this cannot be achieved, it is essential to stay as close as practicable.

All-Way Stop Controlled Approaches

- Mark crosswalks on all approaches with curb ramps, unless safety concerns suggest otherwise. In the Champaign-Urbana area, this is recommended along Safe Walking Routes to K-8 schools, and can be considered at all other intersections.
- Especially at skewed intersections, marked crosswalks need to be kept close to the turning traffic so that pedestrians stay within the driver's line of sight. If this cannot be achieved, it is essential to stay as close as practicable.

Uncontrolled Locations

- A crosswalk should only be installed at an uncontrolled location when sufficient demand exists to justify its installation.
- The location is 300 feet or more from a signalized or stop-controlled crossing location.
- The location has sufficient sight distance (sight distance in feet should be greater than or equal to 8 times the speed limit), and/or sight distance will be improved prior to marking the crosswalk.

Trail Crossings

Trail crossings should be well-lit and well-signed. At all uncontrolled at-grade trail crossings, traffic calming and signage up to 650 feet from the crossing should be considered, based on the posted or 85th percentile speed. MUTCD Table 2C-4 should be used to determine the appropriate ahead of the crossing that warning signage should be placed.

Guidelines for Pedestrian Crossing Treatments

NCHRP 562 Procedure

Figure 27 provides an overview of the procedure to determine an appropriate pedestrian crossing treatment for a location based on the NCHRP 562 Report, *Improving Pedestrian Safety at Unsignalized Crossings*.

Step 1: Select Worksheet

Two worksheets are available – a worksheet for speeds of 35 mph or less, and a worksheet for speeds that exceed 35 mph where the community has a population of less than 10,000 or where a major transit stop exists. The first step is to select the appropriate worksheet. The speeds represent the posted or statutory speed limit or the 85th percentile speed on the major street, whichever is higher. The worksheets available are:

- **Worksheet 1:** 35 mph or less (see Figure 28) and
- **Worksheet 2:** exceeds 35 mph, in communities with less than 10,000 in population, or where a major transit stop exists (see Figure 29).

Step 2: Check Minimum Pedestrian Volume

The minimum pedestrian volume for a peak-hour evaluation is 20 pedestrians per hour for both directions (14 ped/h if the major road speed exceeds 35 mph). If fewer pedestrians are crossing the street, then geometric improvements (rather than signs, signals, or markings) such as traffic calming, median refuge islands, and curb extensions, are alternatives that can be considered.

Step 3: Check Signal Warrant

The MUTCD signal warrants are checked in Step 3 to determine whether to consider a signal at the site. The signal warrant procedures recommended in this step (which will be considered as changes to the MUTCD by the National Committee on Uniform Traffic Control Devices) more closely align the Pedestrian Signal Warrant with the 2003 Peak-Hour Signal Warrant for vehicles (with adjustment made to reflect the counting of pedestrians crossing the major roadway from both approaches rather than only the highest approach as used in the vehicle signal warrant). The worksheets include equations that can determine the minimum required number of crossing pedestrians for a given major road vehicle volume.

Step 4: Estimate Approach Pedestrian Delay

The average pedestrian delay equation from the *Highway Capacity Manual* is used to determine the approach pedestrian delay.

Step 5: Select Appropriate Treatment

The total pedestrian delay, along with the expected compliance, is used to determine the treatment category to consider for the site.

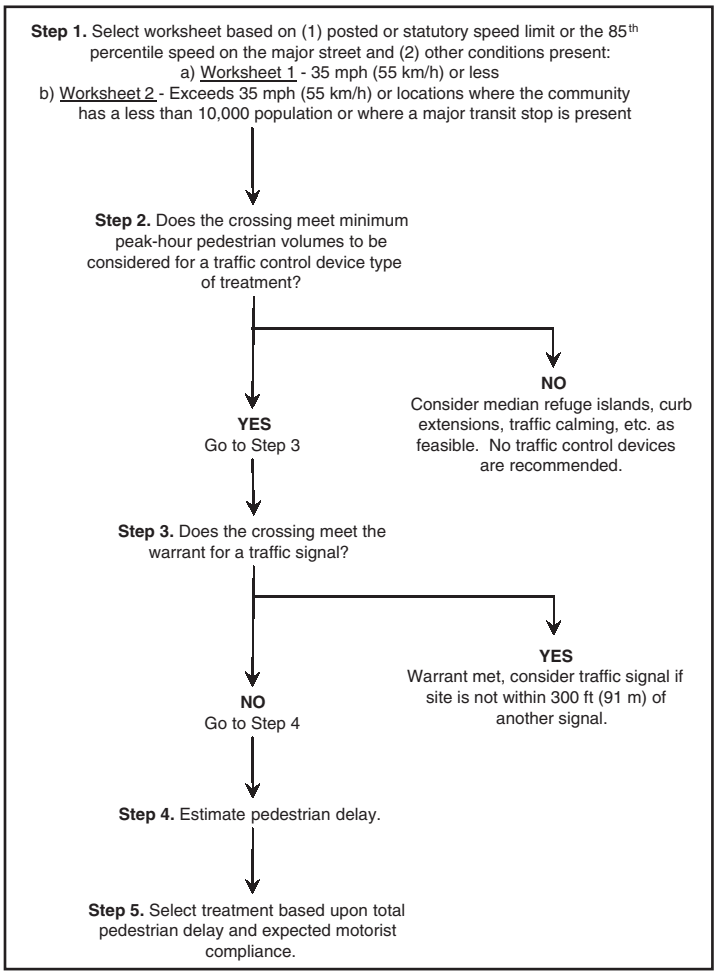


Figure 27: NCHRP 562 Flowchart for Guidelines for Pedestrian Crossing Treatments

WORKSHEET 1: PEAK-HOUR, 35 MPH (55 KM/H) OR LESS

Analyst and Site Information			
Analyst: Analysis Date: Data Collection Date:		Major Street: Minor Street or Location: Peak Hour:	
Step 1: Select worksheet (speed reflects posted or statutory speed limit or 85th percentile speed on the major street): a) Worksheet 1 – 35 mph (55 km/h) or less b) Worksheet 2 – exceeds 35 mph (55 km/h), communities with less than 10,000, or where major transit stop exists			
Step 2: Does the crossing meet minimum pedestrian volumes to be considered for a TCD type of treatment?			
Peak-hour pedestrian volume (ped/h), V_p		*2a*	
If *2a* ≥ 20 ped/h, then go to Step 3.			
If *2a* < 20 ped/h, then consider median refuge islands, curb extensions, traffic calming, etc. as feasible.			
Step 3: Does the crossing meet the pedestrian volume warrant for a traffic signal?			
Major road volume, total of both approaches during peak hour (veh/h), $V_{maj\text{-}s}$		*3a*	
Minimum signal warrant volume for peak hour (use *3a* for $V_{maj\text{-}s}$), SC $SC = (0.00021\ V_{maj\text{-}s}^2 - 0.74072\ V_{maj\text{-}s} + 734.125)/0.75$ OR $[(0.00021\ 3a^2 - 0.74072\ 3a + 734.125)/0.75]$		*3b*	
If *3b* < 133, then enter 133. If *3b* ≥ 133, then enter *3b*.		*3c*	
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50 percent; otherwise enter *3c.*		*3d*	
If *2a* ≥ *3d,* then the warrant has been met and a traffic signal should be considered if not within 300 ft (91 m) of another traffic signal. Otherwise, the warrant has not been met. Go to Step 4.			
Step 4: Estimate pedestrian delay.			
Pedestrian crossing distance, curb to curb (ft), L		*4a*	
Pedestrian walking speed (ft/s), S_p		*4b*	
Pedestrian start-up time and end clearance time (s), t_s		*4c*	
Critical gap required for crossing pedestrian (s), $t_c = (L/S_p) + t_s$ OR [(*4a*/*4b*) + *4c*)]		*4d*	
Major road volume, total both approaches or approach being crossed if median refuge island is present during peak hour (veh/h), $V_{maj\text{-}d}$		*4e*	
Major road flow rate (veh/s), $v = V_{maj\text{-}d}/3600$ OR [*4e/3600*]		*4f*	
Average pedestrian delay (s/person), $d_p = (e^{v\ tc} - v\ t_c - 1) / v$ OR $[\ (e^{4f\ x\ 4d} - 4f\ x\ 4d - 1) / 4f\ ]$		*4g*	
Total pedestrian delay (h), $D_p = (d_p \times V_p)/3{,}600$ OR [(*4g*×*2a*)/3600] (this is estimated delay for all pedestrians crossing the major roadway without a crossing treatment – assumes 0% compliance). This calculated value can be replaced with the actual total pedestrian delay measured at the site.		*4h*	
Step 5: Select treatment based upon total pedestrian delay and expected motorist compliance.			
Expected motorist compliance at pedestrian crossings in region, Comp = high or low		*5*a	

Total Pedestrian Delay, D_p (from *4h*) and Motorist Compliance, Comp (from *5a*)	**Treatment Category** (see Descriptions of Sample Treatments for examples)
$D_p \geq 21.3$ h (Comp = high or low) OR 5.3 h ≤ D_p < 21.3 h and Comp = low	RED
1.3 h ≤ D_p < 5.3 h (Comp = high or low) OR 5.3 h ≤ D_p < 21.3 h and Comp = high	ACTIVE OR ENHANCED
D_p < 1.3 h (Comp = high or low)	CROSSWALK

Figure 28: NCHRP 562 Worksheet 1

WORKSHEET 2: PEAK-HOUR, EXCEEDS 35 MPH (55 KM/H)

Analyst and Site Information			
Analyst: Analysis Date: Data Collection Date:		Major Street: Minor Street or Location: Peak Hour:	
Step 1: Select worksheet (speed reflects posted or statutory speed limit or 85th percentile speed on the major street): a) Worksheet 1 – 35 mph (55 km/h) or less b) Worksheet 2 – exceeds 35 mph (55 km/h), communities with less than 10,000, or where major transit stop exists			
Step 2: Does the crossing meet minimum pedestrian volumes to be considered for a TCD type of treatment?			
Peak-hour pedestrian volume (ped/h), V_p		*2a*	
If *2a* ≥ 14 ped/h, then go to Step 3.			
If *2a* < 14 ped/h, then consider median refuge islands, curb extensions, traffic calming, etc. as feasible.			
Step 3: Does the crossing meet the pedestrian volume warrant for a traffic signal?			
Major road volume, total of both approaches during peak hour (veh/h), V_{maj-s}		*3a*	
Minimum signal warrant volume for peak hour (use 3*a* for V_{maj-s}), SC SC = (0.00035 V_{maj-s}^2 – 0.80083 V_{maj-s} + 529.197)/0.75 OR [(0.00035 *3a*^{2} – 0.80083 *3a* + 529.197)/0.75]		*3b*	
If *3b* < 93, then enter 93. If *3b* ≥ 93, then enter *3b*.		*3c*	
If 15th percentile crossing speed of pedestrians is less than 3.5 ft/s (1.1 m/s), then reduce *3c* by up to 50 percent; otherwise enter *3c.*		3*d*	
If *2a* ≥ *3d,* then the warrant has been met and a traffic signal should be considered if not within 300 ft (91 m) of another traffic signal. Otherwise, the warrant has not been met. Go to Step 4.			
Step 4: Estimate pedestrian delay.			
Pedestrian crossing distance, curb to curb (ft), L		*4a*	
Pedestrian walking speed (ft/s), S_p		*4b*	
Pedestrian start-up time and end clearance time (s), t_s		*4c*	
Critical gap required for crossing pedestrian (s), $t_c = (L/S_p) + t_s$ OR [(*4a*/*4b*) + *4c*)]		*4d*	
Major road volume, total both approaches or approach being crossed if median refuge island is present during peak hour (veh/h), V_{maj-d}		*4e*	
Major road flow rate (veh/s), $v = (V_{maj-d}/0.7)/3600$ OR [*(4e/0.7)/3600*]		*4f*	
Average pedestrian delay (s/person), $d_p = (e^{v\,tc} – v\,t_c – 1) / v$ OR $[\,(e^{4f\,x\,4d} – 4f\,x\,4d – 1) / 4f\,]$		*4g*	
Total pedestrian delay (h), $D_p = (d_p \times V_p)/3{,}600$ OR [(*4g*×*2a*)/3600] (this is estimated delay for all pedestrians crossing the major roadway without a crossing treatment – assumes 0% compliance). This calculated value can be replaced with the actual total pedestrian delay measured at the site.		*4h*	
Step 5: Select treatment based upon total pedestrian delay and expected motorist compliance.			
Expected motorist compliance at pedestrian crossings in region, Comp = high or low		*5*a	

Total Pedestrian Delay, D_p (from *4h*) and Motorist Compliance, Comp (from *5a*)	**Treatment Category** (see Descriptions of Sample Treatments for examples)
$D_p \geq 21.3$ h (Comp = high or low) OR 5.3 h ≤ D_p < 21.3 h and Comp = low	RED
$D_p < 5.3$ h (Comp = high or low) OR 5.3 h ≤ D_p < 21.3 h and Comp = high	ACTIVE OR ENHANCED

Figure 29: NCHRP 562 Worksheet 2

Description of NCHRP 562 Treatments

The devices discussed in the Treatment Category of Figure 29 have been divided into five categories:

- **Crosswalk:** This category encompasses standard crosswalk markings and pedestrian crossing signs, as opposed to unmarked crossings.
- **Enhanced:** This category includes those devices that enhance the visibility of the crossing location and pedestrians waiting to cross. Warning signs, markings, or beacons in this category are present or active at the crossing location at all times.
- **Active:** Also called "active when present," this category includes those devices designed to display a warning only when pedestrians are present or crossing the street.
- **Red:** This category includes those devices that display a circular red indication (signal or beacon) to motorists at the pedestrian location.
- **Signal:** This category pertains to traffic control signals.

Crossing Location Evaluation Procedures and Considerations

This more comprehensive pedestrian crossing location evaluation procedure has been adapted from the City of Boulder, CO *Pedestrian Crossing Treatment Installation Guidelines*.

Evaluation Steps

Evaluation of an individual crossing location for potential crossing treatments in the Champaign-Urbana urbanized area should include the following four basic steps:

Step 1: Identification and Description of Crossing Location

Step 2: Physical Data Collection

Step 3: Traffic Data Collection and Operational Observations

Step 4: Apply Data to Figure 31 and Table 1 to Determine Appropriate Treatments

The Crossing Location Evaluation Worksheet is included in Figure 30, which will guide municipal agency staff through these steps. A detailed discussion of each of these procedures is provided in the following text.

Step 1: Identification and Description of Crossing Location

a) Identify the pedestrian crossing location including the major street and specific location of the crossing (i.e. cross-street, street address, intersection path or trail, etc.).

b) Determine if the crossing location connects both ends of a shared-use path. If it does, the minimum pedestrian volume requirements are not required to be met to apply the treatments prescribed in Table 1.

c) Note the posted speed along the major street at the crossing location.

d) Identify the existing traffic control (if any) and any existing crossing treatments (signs, markings, or physical treatments), street lighting, and curb ramps.

Step 2: Physical Data Collection

a) Determine the existing roadway configuration, including the number of lanes and the presence of painted or raised medians at the crossing location.

b) Identify the nearest marked or protected crossing and measure the distance to this crossing.

c) Measure the stopping sight distance (SSD) on all vehicular approaches to the crossing. If the SSD is less than eight times (8x) the posted speed limit (in feet), determine if improvements (such as removal of obstructions) and/or lowering of the posted speed limit are feasible means to mitigate the inadequate SSD.

Step 3: Traffic Data Collection and Operational Observations

a) Gather or collect pedestrian crossing volumes during the peak hours of use. This will typically involve AM, mid-day, and PM peak hours. Locations near schools may only require two hours of data collection (AM and PM peak hours corresponding to school opening and closing times). All pedestrian volumes should include and differentiate between pedestrians and bicyclists and should note separately the number of young, elderly, and/or disabled pedestrians. For locations where school crossing traffic is anticipated, the volume of student pedestrians (school age pedestrians on their way to/from school) should also be separately noted.

Whenever possible, pedestrian and bicycle volumes should be collected during warm weather months (late March through early November), on University of Illinois spring and fall semester class days (late March through early May, late August through early November), and during fair weather conditions to represent peak crossing activity (i.e. no snow, rain, or high winds). If K-12 school

traffic is an issue, the counts should be scheduled on school days when classes are in session. Given the potential fluctuation in pedestrian traffic from day to day, it may be necessary to collect up to three days of data (use additional Crossing Location Evaluation Worksheets as needed) to determine if an enhanced pedestrian crossing treatment is warranted as follows:

- Collect pedestrian data on day one. If the minimum pedestrian volume threshold (see Figure 31) is exceeded, no further pedestrian data collection is needed. If the threshold has not been exceeded, but at least 50% of the minimum pedestrian volume was observed, proceed to a second day of data collection.
- Collect pedestrian data on day two. If the minimum pedestrian volume threshold is exceeded, no further pedestrian data collection is needed. If the threshold has not been met but again the volume is at least 50% of the minimum threshold, proceed to a third day of data collection.
- Collect pedestrian data on day three. If the minimum pedestrian volume still has not been met, then no marked pedestrian crossing treatment is warranted by pedestrian crossing volume.

b) Gather or collect hourly and average daily traffic (ADT) volumes for automobile traffic along the major roadway at the crossing location. A one day sample should be adequate, with hourly volumes collected during the same hour as the pedestrian crossing volumes.

c) Due to the potential for vehicular traffic queues to impact safety at the crossings, the presence of queues extending from downstream signals or intersections back into the crossing location should be observed, as well as any "differential" queuing that may occur on a lane to lane basis. While collecting automobile traffic data, the formation of vehicle queues from adjacent intersections should be noted. If one or both directional queues reaches back to the crossing location, the number of times per hour that it reaches the crossing location should be noted and the maximum queue length should also be recorded. If there is more than one through lane in each direction, it should be noted if the queues reaching back to the crossing are approximately the same length in each lane, or if there a significant differences in the length of the queues in each lane. If the queues are routinely of different length as they extend beyond the crossing location, notes should be made as to the potential cause of the differential queuing.

Step 4: Apply Data to Figure 31 and Table 1 to Determine Appropriate Treatments

a) Using the available data, utilize Figure 31 – Pedestrian Crossing Treatment Flowchart, and Table 1 – Criteria for Crossing Treatments at Uncontrolled Locations (if applicable) to determine appropriate treatment(s) for signalized, stop-controlled, or uncontrolled locations. Also consider and incorporate the following information in "Additional Evaluation Considerations" as appropriate.

Figure 30: Crossing Location Evaluation Worksheet

STEP 1 - LOCATION DESCRIPTION

Major Street: _____ Crossing Location: _____

Is this a multi-use path crossing? □ Yes □ No Posted Speed Limit: _____ mph

Existing Traffic Control: □ Stop Sign □ Traffic Signal □ Uncontrolled

Existing Crossing Treatments (if any): _____

_____

Nearby Pedestrian Generators (School, transit stop, commercial, etc.): _____

_____

STEP 2 - PHYSICAL DATA

Roadway Configuration: □ 2-Lane □ 5 Lane w/ Striped Median
□ 3 Lane w/ Striped Median □ 5 Lane w/ Raised Median
□ 3 Lane w/ Raised Median □ 6 Lane
□ 4 Lane □ Other: _____

Crossing Distance By Direction: _____ ft total _____ ft to median (If applicable + note direction) _____ ft to median (if applicable + note direction)

Nearest Marked or Protected Pedestrian Crossing: _____ Distance to: _____ ft

(For uncontrolled location only) Stopping Sight Distance (SSD) = _____ ft _____ ft

Is SSD ≥ 8x Speed Limit? □ Yes □ No If No, are improvements to SSD feasible? □ Yes □ No

STEP 3a - Traffic Data

Pedestrian Crossing Volumes / Bicycle Crossing Volumes:

	AM	Mid-Day	PM	Other
Time:	to	to	to	to
Date/Day of Week:	/	/	/	/
Major Street Vehicular Volume (Hourly):				
# of Transit Boardings (if applicable)				
# of Young Peds / Bicyclists	/	/	/	/
# of Elderly Peds				
# of Disabled Peds				
# of Non-Y/E/D Peds / Bicyclists	/	/	/	/
TOTAL PEDS (Actual) (Include All Bicyclists in Total Sum)				
TOTAL PEDS (**Adjusted** for 2x Y/E/D)				

Major Street Vehicular Volume (**Daily**): ADT = _____ veh/day

Figure 30: Crossing Location Evaluation Worksheet (continued)

STEP 3b - OPERATIONAL OBSERVATIONS

Nearest Intersection (Direction #1): Crossing Street Name: _____

Located _____ft to the □ N □ S □ E □ W of crossing location

Signalized? □ Y □ N Distance from Crossing _____ ft

	AM	Mid-Day	PM	Other
How many times per hour did the downstream vehicle queue back up into pedestrian crossing?				
If multiple lanes per direction, are queue lengths approximately equal?	Y N	Y N	Y N	Y N
If NO (above), what lane is longer (inside, outside, middle) and by how much (feet)?				

Nearest Intersection (Direction #2): Cross Street Name: _____

Located _____ ft to the □ N □ S □ E □ W of crossing location

Signalized? □ Y □ N Distance from Crossing _____ ft

	AM	Mid-Day	PM	Other
How many times per hour did the downstream vehicle queue back up into pedestrian crossing?				
If multiple lanes per direction, are queue lengths approximately equal?	Y N	Y N	Y N	Y N
If NO (above), what lane is longer (inside, outside, middle) and by how much (feet)?				

STEP 4 - APPLY DATA TO FIGURE 31 and TABLE 1

Recommended Treatment(s): _____

_____

_____

Pedestrian Crossing Treatment Flowchart

Figure 31 is a flowchart to help determine the most appropriate pedestrian crossing treatment for a location. Following are notes related to this flowchart.

(1) Exceptions to the 1,500 vehicles per day (vpd) minimum roadway volume threshold may be made for School Crossings where the peak hour traffic exceeds 10% of the daily traffic.

(2) Minimum Pedestrian Volume Thresholds:

- 20 peds per hour* in any one hour, or
- 18 peds per hour* in any two hours, or
- 15 peds per hour* in any three hours

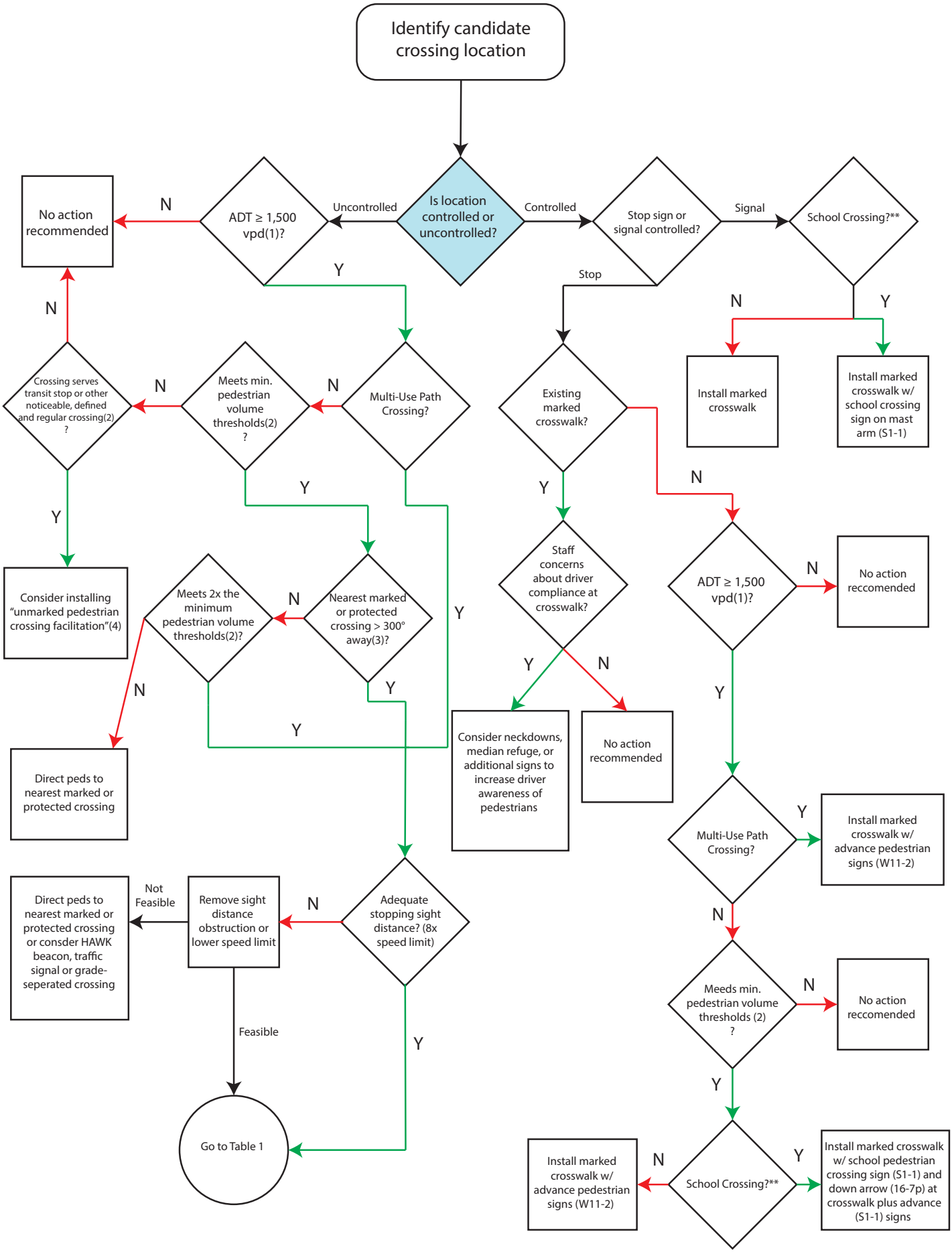
** Young, elderly, and disabled pedestrians count 2x towards volume thresholds*

*** School Crossing defined as a crossing location where ten or more student pedestrians per hour are crossing.*

(3) Distance to the nearest marked or protected crossing may be reduced to 200' in urban conditions, subject to engineering judgment, where 1) the crosswalk does cross any auxiliary lanes, and 2) crossing treatments and crossing activity would not create undue restriction to vehicular traffic operations.

(4) An "unmarked pedestrian crossing facilitation" is any treatment that improves a pedestrian's ability to cross a roadway, short of the marked, signed and enhanced crossings detailed in Table 1. Installation of this type of pedestrian facilitation is subject to engineering judgment and may include curb ramps and/or a raised median refuge. However, no effort is made to attract pedestrians or recommend that pedestrians cross at this location. The treatments simply provide an improvement for a low volume pedestrian crossing where pedestrians are already crossing and will like continue to cross.

Figure 31: Pedestrian Crossing Treatment Flowchart



Additional Evaluation Considerations

The following information should be considered by the user of these guidelines when determining the appropriate pedestrian crossing treatment:

Types of Crossing Treatments at Uncontrolled Locations *(See also Table 1)*

Table 1 identifies six primary types of uncontrolled crossing treatments for consideration depending on the physical roadway conditions, vehicle volume, pedestrian volume at the potential crossing location, etc. The crossing types are as follows:

Crossing Type A:

- Marked crosswalk
- Pedestrian crossing warning signs (W11-2) mounted on the side of the roadway at the crossing, with diagonal down arrow placards (W16-7P)
- Standard advance pedestrian warning signs (W11-2) mounted in advance of the crossing
- If the location is a school crossing, then standard S1-1 signs should be used

Crossing Type B:

- Same as Type A above, plus
- "State Law – Stop for Pedestrians" signs (R1-6) mounted on sign posts in the median when present. If no median is present, sign posts can be considered for installation on flexible bollards on the centerline.

Crossing Type C:

- Same as Type B above plus
- Add curb extensions and/or median refuge island to shorten the pedestrian crossing distance and increase the visibility of pedestrians to approaching motorists

Crossing Type D:

- Marked crosswalk
- Median refuge island [Note: If a median refuge can not be constructed on a 2-way street, then go to Crossing Type F]
- Pedestrian crossing warning signs (W11-2) mounted on the side of the roadway and in the median at the crossing, with diagonal down arrow placards (W16-7P)
- Pedestrian actuated Rectangular Rapid Flash Beacons (RRFBs) mounted with the Pedestrian crossing signs
- Standard advance pedestrian warning signs (W11-2) mounted in advance of the crossing
- If there are 2 approach lanes in a single direction, installation of advance stop bars and "Stop Here For Pedestrians" (R1-5b) signs is required in the University District, and should be considered outside of the University District
- If the location is a school crossing, then standard S1-1 signs should be used
- Consider adding curb extensions if on-street parking exists and storm drainage can be accommodated
- If pedestrian volumes are extremely high, go to Crossing Type F

Crossing Type E:

- Where speed limit is initially greater than or equal to 45 miles per hour
- Determine if the speed limit can be effectively reduced to 40 mph AND a raised median refuge island can be installed
- If so, go to Crossing Type D
- If not, go to Crossing Type F

Crossing Type F:

- Crossing has 3 or more through lanes in a given direction or is otherwise not suitable for an uncontrolled marked crosswalk
- Consider HAWK beacon, pedestrian traffic signal, or grade-separated pedestrian crossing
- Refer to *City of Boulder Pedestrian Crossing Treatment Installation Guidelines* Figure 2 when considering crossing treatment type
- Must consider corridor signal progression, grades, physical constraints, and other engineering factors

In Table 1 there are two columns that list:

- The number of lanes crossed to reach a refuge
- The number of "multiple threat" lanes per crossing

This information does not directly play in to the use of Table 1, but they do provide important context for the user as they help distinguish the crossing types and support the difference in recommended crossing treatments.

TABLE 1 - CRITERIA FOR CROSSING TREATMENTS AT UNCONTROLLED LOCATIONS

Roadway Configuration	# of lanes crossed to reach a refuge	# of multiple threat lanes per crossing	Roadway ADT (i.e. VPD = vehicles per day) and Posted Speed															
			1,500-9,000 vpd				9,000-12,000 vpd				12,000-15,000 vpd				> 15,000 vpd			
			≤ 30 mph	35 mph	40 mph	≥ 45 mph	≤ 30 mph	35 mph	40 mph	≥ 45 mph	≤ 30 mph	35 mph	40 mph	≥ 45 mph	≤ 30 mph	35 mph	40 mph	≥ 45 mph
2 Lanes (one way street)	2	1	**A**	**B**	**C**	**E**	**A**	**B**	**C**	**E**	**B**	**B**	**C**	**E**	**B**	**C**	**C**	**E**
2 Lanes (two way street with no median)	2	0	**A**	**B**	**C**	**E**	**A**	**B**	**C**	**E**	**A**	**B**	**C**	**E**	**B**	**C**	**C**	**E**
3 Lanes w/ Raised Median	1 or 2	0 or 1	**A**	**B**	**D**	**E**	**A**	**C**	**D**	**E**	**B**	**D**	**D**	**E**	**C**	**D**	**D**	**E**
3 Lanes w/ Striped Median	3	0 or 1	**C**	**C**	**D**	**E**	**C**	**C**	**D**	**E**	**C**	**C**	**D**	**E**	**C**	**D**	**D**	**E**
4 Lanes (two way street with no median)	4	2	**A**	**D**	**D**	**E**	**B**	**D**	**D**	**E**	**B**	**D**	**D**	**E**	**D**	**D**	**D**	**E**
5 Lanes w/ Raised Median	2 or 3	2	**A**	**B**	**D**	**E**	**B**	**C**	**D**	**E**	**B**	**C**	**D**	**E**	**C**	**C**	**D**	**E**
5 Lanes w/ Striped Median	5	2	**D**	**D**	**D**	**E**	**D**	**D**	**D**	**E**	**D**	**D**	**D**	**E**	**D**	**D**	**D**	**E**
6 Lanes (two way street with or without median)	3 to 6	4	**F**	**F**	**F**	**F**	**F**	**F**	**F**	**F**	**F**	**F**	**F**	**F**	**F**	**F**	**F**	**F**

Notes:

1. Painted medians can never be considered a refuge for a crossing pedestrian. Similary, a 4 foot wide raised median next to a left turn lane can only be considered a refuge for pedestrians if the left turning volume is less than 20 vehicles per hour (meaining that in most cases the left turn lane is not occupied while the pedestrian is crossing).
2. A multiple threat lane is defineed as a through lane where it is possible for a pedestrian to step out in front of a stopped vehicle in the adjacent travel lane (either through or turn lane).

Table 1: Criteria for Crossing Treatments at Uncontrolled Locations

4 Additional Considerations

Additional considerations should be made when analyzing how to improve pedestrian crossings in the Champaign-Urbana area.

Challenges

A common comment in the community is that technology distracts pedestrians, especially in the University District. If pedestrians are looking at smartphones or MP3 players while walking, they are endangering themselves if they do not look up for vehicles while crossing streets.

Another important topic currently being discussed in the community is equity. During the development of the Ann Arbor, MI Crosswalk Design Guidelines Project in 2016, citizens felt that investments should not occur only where residents are advocating, but distributed equally across their city. The same approach should be taken in the Champaign-Urbana area, keeping in mind that funding is another constant challenge for CUUATS member agencies.

Regarding the installation of HAWK Signals, there may be a challenge to installing more of these in the Champaign-Urbana area. Section 4F.02 of the Illinois Supplement of the MUTCD states that "If used, pedestrian hybrid beacons shall be installed at least 100 feet from side streets or driveways and at least 300 feet from traffic signals or railroad grade crossings with active warning devices." The driveway distance requirement is problematic in the urban environments of the Champaign-Urbana area since there are many entrances on streets, and this requirement elevates all driveways to the same level as side streets. A proposed modification to Section 4F.02 of the Illinois Supplement of the MUTCD is "If used, pedestrian hybrid beacons shall be installed at least 100 feet from side streets or driveways with traffic control and at least 300 feet from traffic signals or railroad grade crossings with active warning devices." A driveway without traffic control usually has a low volume of entering/exiting vehicles, and is not viewed as a problem. Without such a modification, it is unlikely that many more HAWKs can be installed in the Champaign-Urbana area.

Regarding Accessible Pedestrian Signals (APS), they should be installed with the installation of a new traffic signal or when updating existing traffic signals. CUUATS created APS Guidelines in 2002 that are available on the CCRPC website. The CUUATS Sidewalk Network Inventory and Assessment also addresses APS. However, more guidance could be provided with the adoption of a final rule for the Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way, or PROWAG. As future research and recommendations are made for APS, they should be incorporated into in these guidelines, the CUUATS APS Guidelines, and the CUUATS Sidewalk Network Inventory and Assessment.

Development Effects on Pedestrians

Development patterns that reduce the speed and number of multi-lane roads should be encouraged. However, pedestrian access is not just impeded by roads, but sometimes private parking lots as well.

Developers should submit internal pedestrian circulation plans to municipalities for all non-residential proposals that facilitiate the safest, smoothest transition from the sidewalk or parking lot to the main building entrance. The circulation plan should include clearly marked walkways for pedestrians, delineated by textured or colored pavement or pavement stencils. In large parking lots, a continuous sidewalk should be provided in parking lot medians from the parking lot to a marked crossing to the building entrance. All new public buildings, meaning buildings that the public may use, such as shopping centers, should have at least one main entrance immediately adjacent to the sidewalk.

Non-Infrastructure Efforts

So far, this document has addressed engineering solutions to improve pedestrian crossing safety. However, there are other non-infrastructure "E's" that can improve the culture of motorist compliance

towards stopping for pedestrians, which are Education, Encouragement, Enforcement, Evaluation and Planning.

Emphasis on education and enforcement are needed to build awareness about expectations among drivers, pedestrians, and cyclists. The 2005 FHWA crosswalk study shows that the large percentage of pedestrian crashes that occured due to motorists failing to yield to pedestrians indicate a strong need for improved driver enforcement and education programs that emphasize the importance of stopping for pedestrians.

Education and awareness campaigns like CUMTD's "Bee Scene" (Be Aware. Be Alert. Be Seen.) and efforts of the Champaign-Urbana Safe Routes to School (C-U SRTS) Project aim to educate and encourage safe behaviors between pedestrians, bicyclists, and motorists. These efforts can help combat pedestrian safety issues like distracting technology.

Further non-infrastructure recommendations can be found in municipal pedestrian plans, including Walk Champaign, the Savoy Bike & Pedestrian Plan, and the Urbana Pedestrian Master Plan (currently under development).

CUUATS staff and member agencies should also evaluate pedestrian crossing enhancements before and after improvements are made.

Conclusion

The Crossing Location Evaluation Procedures and Considerations adapted from the City of Boulder, CO in Chapter 3 is recommended as the preferred method for CUUATS member agencies to determine the most appropriate pedestrian crossing enhancement treatment for locations in the Champaign-Urbana area.

Ultimately, pedestrians should use caution when crossing streets, regardless of who has the legal right-of-way, since it is the pedestrian who suffers the most physical injury in a collision with a motor vehicle.

5 Sources

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6 Glossary

Crosswalk: Portion of roadway designated for pedestrians to use to cross the street. Crosswalks exist at the intersection of roadways regardless of whether they are marked or unmarked.

Continental Crosswalk: A crosswalk consisting of a series of wide stripes perpendicular to the direction of travel, or parallel to the curb, for the length of the crossing. These are typically striped in an effort to increase driver visibility of pedestrians.

Marked Crosswalk: Pavement markings across a street on an intersection leg or mid-block that denote a pedestrian crossing.

Pedestrian: A person who travels on foot, or who uses assistive devices such as a wheelchair, for mobility.

Standard (or Parallel) Crosswalk: A crosswalk consisting of two solid, parallel lines at its outer edges, usually perpendicular to the curb.

Uncontrolled Location: Intersection without a traffic signal or all-way stop.

Unmarked Crosswalk: Any leg of an intersection not marked but connects to a sidewalk on each end.