



City and County of Denver

UNCONTROLLED PEDESTRIAN CROSSING GUIDELINES

Prepared for:



DENVER
THE MILE HIGH CITY

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for Denver Uncontrolled Pedestrian Crossing Guidelines

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Introduction

PURPOSE AND SCOPE

The purpose of the Uncontrolled Pedestrian Crossing Guidelines is to serve as the policy document that guides staff in determining where and how to improve an uncontrolled crosswalk within the City and County of Denver on City and County of Denver owned and maintained streets. The Uncontrolled Pedestrian Crossing Guidelines provide guidance to determine if a marked crosswalk is appropriate at a particular location; they then identify a range of enhancement treatments that may be appropriate depending on the site characteristics.

HOW TO USE THESE GUIDELINES

These guidelines are intended to be used by City and County of Denver engineers and planners in determining whether to mark an uncontrolled crosswalk, and then to determine which treatment is most appropriate to ensure efficient function for all users and maintain pedestrian safety. When a specific location is being considered for a marked crosswalk – due to public feedback, a new development, or staff recommendation – this document serves as a guide to consistently and transparently determine an appropriate treatment, if any. It contains a background of relevant city and state regulations and design standards regarding pedestrian crosswalks. These guidelines provide the necessary references for clarifying the legal rights of people walking and people driving in crosswalk scenarios.

Once a specific location is identified, refer to the flowchart in Figure 1 to determine



if a marked crosswalk is appropriate. The flowchart brings together various criteria to make this determination. The “Evaluating Candidate Locations” section further explains how to apply the flowchart. If a marked crosswalk is appropriate, the “Crosswalk Treatment Guide” section contains a table that serves as a guide in identifying any enhanced treatments that are recommended for that location.

CROSSWALK DEFINITIONS

Denver Revised Municipal Code Section 54-1 provides the following definition for a crosswalk:

Crosswalk shall mean that portion of a roadway included within the prolongation or connection of the lateral lines of sidewalks at intersections, or any portion of a roadway distinctly indicated for pedestrian crossing by lines or other marking on the surface.

The following definitions are also helpful when implementing these guidelines:

An *uncontrolled crosswalk* is a legal crosswalk across a roadway approach not controlled by a stop sign or traffic signal.

A *controlled crosswalk* is a legal crosswalk across a roadway approach controlled by a stop sign or traffic signal.

An *unmarked crosswalk* is a legal crosswalk that does not feature any traffic control markings.

A *marked crosswalk* is a legal crosswalk that features traffic control markings.

A midblock crosswalk is a location not at an intersection, featuring traffic control markings to indicate that it is a legal crosswalk.

It is legal for a pedestrian to cross a local street at any marked or unmarked crosswalk. It is also legal for a pedestrian to cross a roadway between intersections where at least one adjacent intersection is not controlled by a traffic signal device. An example of an illegal crossing is at an unmarked midblock location between two signalized intersections.

OTHER RELEVANT REGULATIONS

As a consolidated city and county, both the Colorado Revised Statutes and Denver Revised Municipal Code can apply to pedestrians and crosswalks in the City and County of Denver.

COLORADO REVISED STATUTES

The Colorado Revised Statutes (CRS) contains a section on pedestrians, within Part 8 of Title 42: Vehicles and Traffic. These statutes contain specifications on pedestrians' right of way when crossing the street, either in a marked or unmarked crosswalk or outside of a crosswalk. Key elements of these statutes include:

Section 42-4-802. Pedestrians' right of way in crosswalks

(1)...When traffic control signals are not in place or not in operation, the driver of a vehicle shall yield the right of way, slowing down or stopping if need be to so yield, to a pedestrian crossing the roadway within a crosswalk when the pedestrian is upon the half of the roadway upon which the

vehicle is traveling or when the pedestrian is approaching so closely from the opposite half of the roadway as to be in danger.

(2)....No pedestrian shall suddenly leave a curb or other place of safety and ride a bicycle, ride an electrical assisted bicycle, walk, or run into the path of a moving vehicle that is so close as to constitute an immediate hazard.

Section 42-4-803. Crossing at other than crosswalks

(1)....Every pedestrian crossing a roadway at any point other than within a marked crosswalk or within an unmarked crosswalk at an intersection shall yield the right-of-way to all vehicles upon the roadway.

(2)....Any pedestrian crossing a roadway at a point where a pedestrian tunnel or overhead pedestrian crossing has been provided shall yield the right of way to all vehicles upon the roadway.

(3)....Between adjacent intersections at which traffic control signals are in operation, pedestrians shall not cross at any place except in a marked crosswalk.

DENVER REVISED MUNICIPAL CODE

In addition to the Colorado Revised Statutes, Denver has adopted the Denver Revised Municipal Code (DRMC). Drivers, bicyclists

and pedestrians within the City and County of Denver can be cited and prosecuted under either state statute or city municipal code. Section 54 of the municipal code specifies traffic regulations. Key elements of the municipal code include:

Section 54-538. Right of way in crosswalks

(a)....When traffic-control signals are not in place or not in operation, the driver of a vehicle shall yield the right of way, slowing down or stopping if need be to so yield to a pedestrian crossing the roadway within a crosswalk when the pedestrian is upon the half of the roadway upon which the vehicle is traveling, or when the pedestrian is approaching so closely from the opposite half of the roadway as to be in danger, but no pedestrian shall suddenly leave the curb or edge of the roadway, or other place of safety and walk or run into the path of a vehicle which is so close that it is impossible for the driver to yield the right of way. A pedestrian's right of way in the crosswalk is modified under the conditions and as stated in Section 54-540.

Section 54-540. Right of way when crossing at other than crosswalks

(a)....Every pedestrian crossing the roadway at any point other than within a marked or unmarked crosswalk at an intersection shall yield the right of way to all vehicles upon the roadway.

(b)....Any pedestrian crossing a roadway at a point where a pedestrian tunnel or overhead pedestrian crossing has been provided, but not using such facility, shall yield the right of way to all vehicles upon the roadway.

Section 54-541. Crossing at right angles.

(b)....It shall be unlawful for any pedestrian to cross a roadway in any manner other than by a direct route at right angles to the roadway edge or by the shortest route from the nearest to the opposite roadway edge, except in a marked crosswalk or where crossing at any other angle to the roadway edge is authorized by the City Traffic Engineer.

Section 54-542. Prohibited crossing of roadways.

(a)....It shall be unlawful for any pedestrian to cross a roadway at any place except in a crosswalk, between adjacent intersections at which traffic-control signals are in operation; except that pedestrians may cross on area designated as a pedestrian and transit mall at any point between intersections but shall yield the right of way to vehicles lawfully within the area designated as a pedestrian and transit mall.

(b)....It shall be unlawful for any pedestrian to cross a roadway that is a through street or through highway at any place other than a crosswalk.

(c)...Except on a local street, it shall be unlawful for any pedestrian to enter a

the same in any manner other than from the nearest roadway edge; except that pedestrians alighting from stopped vehicles shall proceed by a direct route to the nearest roadway edge before crossing the roadway as provided herein.

(d)...Except on a local street, it shall be unlawful for any pedestrian to cross a roadway directly to a vehicle stopped, parked or standing on the opposite side of the roadway.

Section 54-458. Parking prohibited at specified places.

It shall be unlawful for any person to stop or allow a vehicle to stand except when necessary to avoid conflict with other traffic, or in compliance with law or the directions of a police officer or traffic-control device in any of the following places:

(5)...On a crosswalk

(6)...Within twenty (20) feet of a crosswalk or stop sign at an intersection

(7)...Within thirty (30) feet upon the approach to any flashing beacon or traffic-control signal located at the side of a roadway

DESIGN STANDARDS

MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

The *Manual on Uniform Traffic Control Devices* (MUTCD, Federal Highway Administration, 2009) provides support, standards and guidance for traffic control devices (including markings, signs, beacons and signals) used for marking and enhancing crosswalks. The MUTCD provides standards and guidance for the design of these traffic control devices, and it provides key considerations based on research from "Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations" (FHWA, 2002) regarding whether enhancement devices are necessary given a roadway's characteristics. No warrants are provided for when to mark a crosswalk (this decision is left to local jurisdictions) or for most enhancements; however, application guidance for a pedestrian hybrid beacon and a pedestrian signal warrant is included. The MUTCD states:

Crosswalk lines should not be used indiscriminately. An engineering study should be performed before a marked crosswalk is installed at a location away from a traffic control signal or an approach controlled by a STOP or YIELD sign. The engineering study should consider the number of lanes, the presence of a median,

the distance from adjacent signalized intersections, the pedestrian volumes and delays, the average daily traffic (ADT), the posted or statutory speed limit or 85th-percentile speed, the geometry of the location, the possible consolidation of multiple crossing points, the availability of street lighting, and other appropriate factors.

New marked crosswalks alone, without other measures designed to reduce traffic speeds, shorten crossing distances, enhance driver awareness of the crossing, and/or provide active warning of pedestrian presence, should not be installed across uncontrolled roadways where the speed limit exceeds 40 mph and either:

A. The roadway has four or more lanes of travel without a raised median or pedestrian refuge island and an ADT of 12,000 vehicles per day or greater; or

B. The roadway has four or more lanes of travel with a raised median or pedestrian refuge island and an ADT of 15,000 vehicles per day or greater.

NATIONAL ASSOCIATION OF CITY TRANSPORTATION OFFICIALS (NACTO) URBAN STREET DESIGN GUIDE

The City and County of Denver officially endorsed the National Association of City

Transportation Officials (NACTO) *Urban Street Design Guide*. The guide offers a vision for creating a more livable city and improving the convenience of pedestrians, bicyclists, drivers and transit users. This document provides specific guidance on the design and implementation of conventional and midblock crosswalks.

Recommendations in the NACTO *Urban Street Design Guide* include the addition of vertical elements to midblock crosswalks, increasing sight distance at crosswalks, marking the crosswalk and the implementation of medians or pedestrian refuge islands.

Where there are conflicts between MUTCD and NACTO, standards and guidance within MUTCD take precedence.

COLORADO DEPARTMENT OF TRANSPORTATION (CDOT) ROADWAY DESIGN GUIDE

The types of devices recommended for uncontrolled crosswalks in the CDOT *Roadway Design Guide* are similar to those recommended in this document. However, CDOT has slightly different standards with regards to the device recommended for the number of travel lanes, speed, and volume. If a street is CDOT owned, refer to the CDOT *Roadway Design Guide*.

WHY IMPROVE CROSSWALKS?

It is important to provide designated facilities for pedestrians to use the transportation network safely and without unreasonable delay. Crosswalks provide an important connection for pedestrians. The pedestrian network should be designed in such a way that pedestrians are not unreasonably either forced to wait for a gap in traffic or walk out of their way for an enhanced crosswalk. The *Highway Capacity Manual 2010* states that when a pedestrian is forced to wait 30 seconds or longer, he is highly likely to exhibit risk-taking behavior.

Crosswalks that are appropriately marked and enhanced provide pedestrians with convenient opportunity to cross the street, while maintaining safety. Marked crosswalks are valuable in that they direct pedestrians to a designated place to cross, alert drivers as to the potential presence of pedestrians, and legally establish the crosswalk at non-intersection locations.

Marking and appropriately enhancing crosswalks is one method for creating gaps in traffic to allow pedestrians to cross the street; however, research has not conclusively shown a safety benefit of marking and appropriately enhancing crosswalks. Research studying the effectiveness of various crossing treatments measures yield compliance as a proxy for safety. At the time of this report, National Cooperative Highway Research Program (NCHRP) 17-56 is currently researching the safety effects of marked crosswalks and various enhancement devices. Research on the safety effects of other devices including pedestrian hybrid beacons, lane widths, road diets and medians is already well-documented.

Evaluating Candidate Locations

FLOWCHART

Candidate crosswalk locations should be evaluated using the flowchart in **Figure 1**. Starting at the top of the flowchart, proceed through each box based on whether the location in question does or does not meet the criteria in each box. Proceed through the flow chart until you reach a red box, meaning that the location is inappropriate for a marked crosswalk, or a green box, meaning that a location is appropriate for a marked crosswalk. Definitions and instructions for calculating each criteria are discussed in the following section.

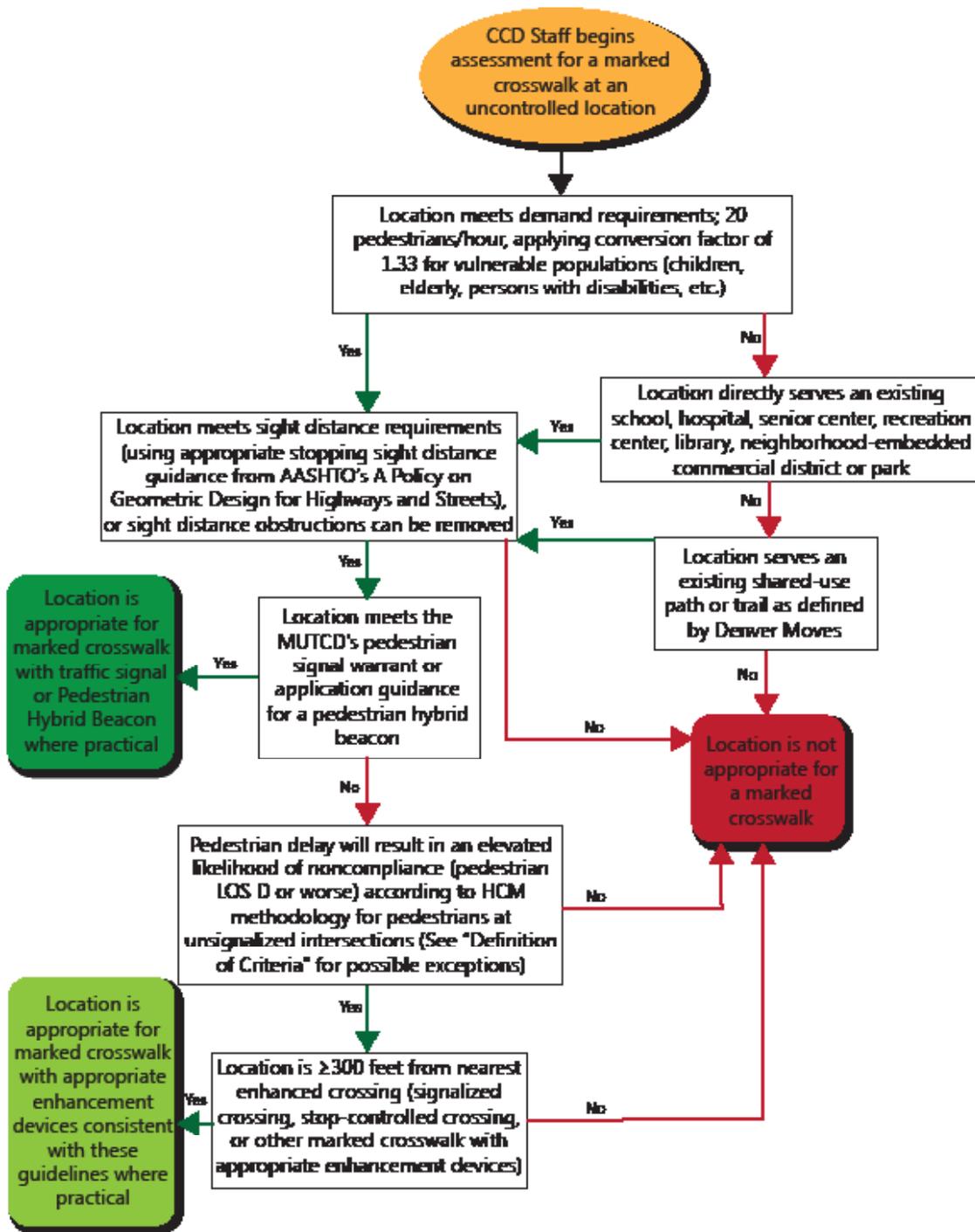


Figure 1: Candidate location flowchart

DEFINITION OF CRITERIA

LOCATION MEETS DEMAND REQUIREMENT

This location has at least 20 pedestrians per hour, when applying the conversion factor of 1.33 for vulnerable populations, including children, the elderly and persons with disabilities. In order to determine if a location meets this criterion, complete a pedestrian count during the anticipated peak hours. Count the number of pedestrians at the candidate crosswalk location and within the vicinity likely to use the crosswalk location. Count every vulnerable user as 1.33 people. The identification of vulnerable users will be determined by professional judgment of the individual counting in the field. Identify the peak hour and determine if that is greater than or equal to 20 pedestrian equivalents. Counts no more than two years old can be applied as long as the location's conditions have not significantly changed.

LOCATION DIRECTLY SERVES AN EXISTING SCHOOL, HOSPITAL, SENIOR CENTER, RECREATION CENTER, LIBRARY, COMMERCIAL DISTRICT OR PARK

Examine the surrounding land uses and determine if the proposed crosswalk directly serves a school, hospital, senior center, recreation center, library, commercial district or park.

LOCATION SERVES AN EXISTING SHARED-USE PATH OR TRAIL AS DEFINED BY DENVER MOVES

Identify the location of the proposed crosswalk on the Denver Moves map. Determine if the proposed crosswalk is an extension of a facility that is identified as a shared-use path or trail. If the segment at either end of the proposed crosswalk is identified as a shared-use path or trail, then it would qualify.

LOCATION MEETS THE MUTCD'S APPLICATION GUIDANCE FOR A PEDESTRIAN HYBRID BEACON OR PEDESTRIAN SIGNAL WARRANT

The 2009 Edition of the *Manual on Uniform Traffic Control Devices* (MUTCD) provides guidance on the installation of pedestrian hybrid beacons for major streets. Use **Figure 2** for roadways where the 85th percentile speed is 35 mph or less, and **Figure 3** for roadways greater than 35 mph. Determine the number of vehicles in the peak hour on both approaches of the major street. Determine the number of pedestrians in the peak hour. Measure the length of the proposed crosswalk. If the plotted point falls above the line of the respective crosswalk length shown in **Figures 2 and 3**, then a pedestrian hybrid beacon is recommended.

MUTCD PEDESTRIAN HYBRID BEACON APPLICATION GUIDANCE

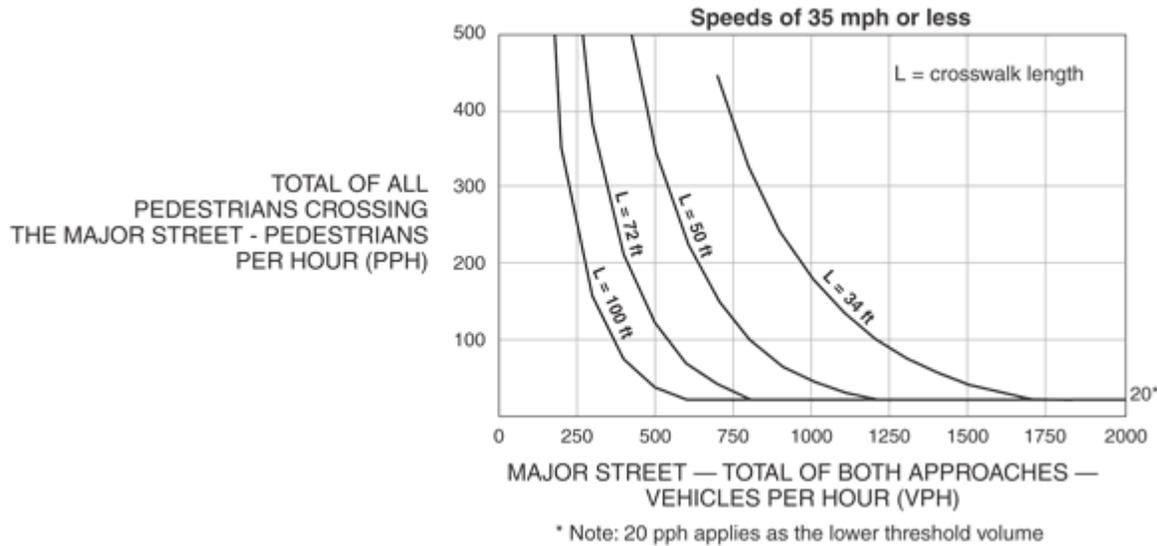


Figure 2: MUTCD guidelines for the installation of pedestrian hybrid beacons on low-speed roadways

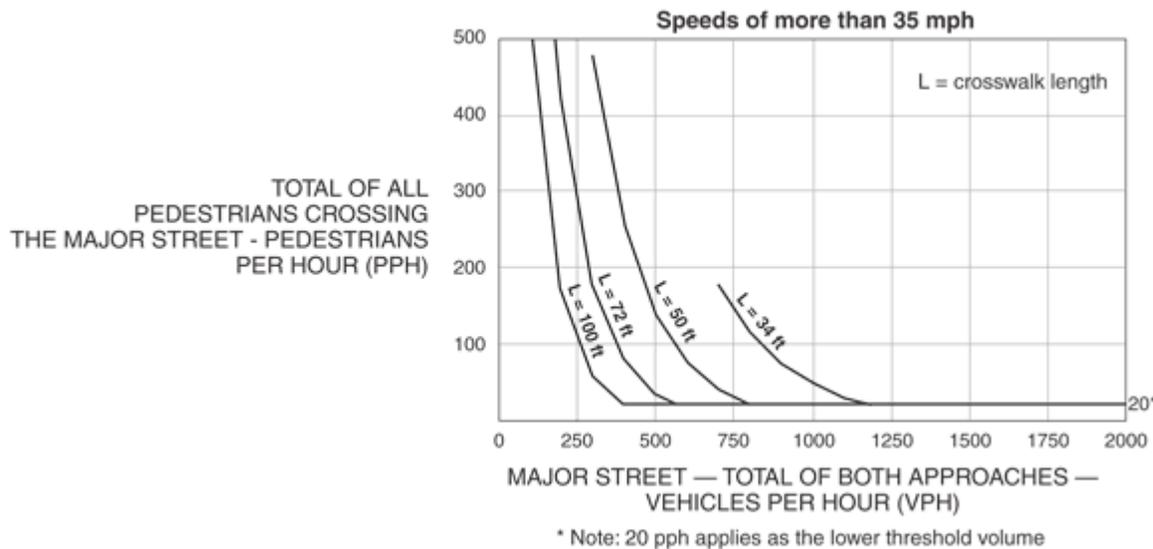
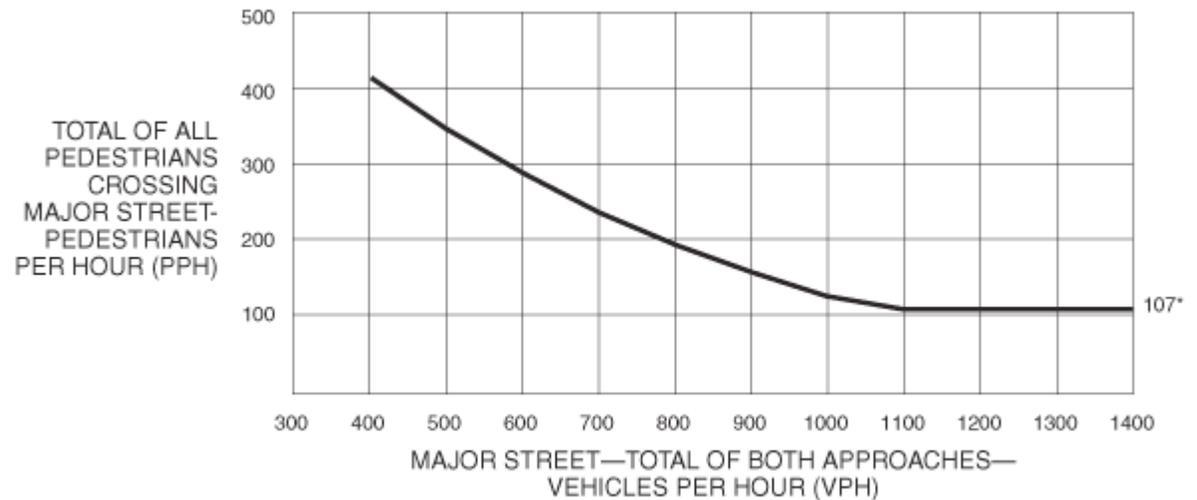


Figure 3: MUTCD guidelines for the installation of pedestrian hybrid beacons on high-speed roadways

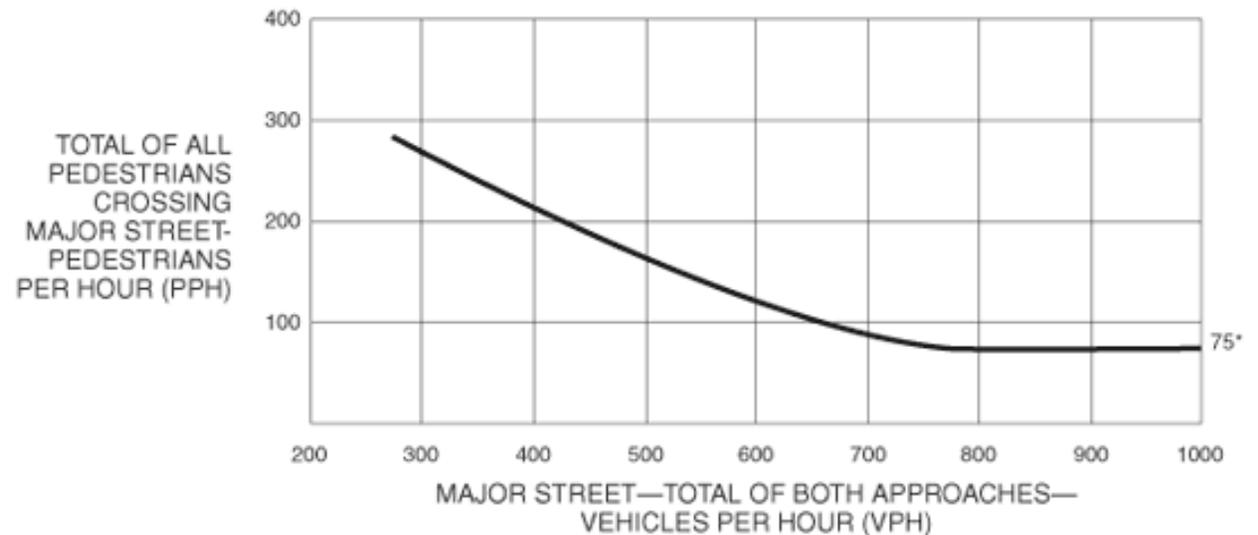
The 2009 Edition of the *Manual on Uniform Traffic Control Devices* (MUTCD) also provides warrants for the installation of pedestrian signals. The following four figures show the number of pedestrians per hour crossing the major street necessary to warrant a pedestrian signal based on the number of vehicles per hour on the major street. **Figures 4 and 5** show the warrant for the four hour volumes and **Figures 6 and 7** show the warrant for the peak hour. **Figures 5 and 7** show the warrant when a location has a posted speed limit or the 85th-percentile speed on the major street exceeds 35 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000. These circumstances are referred to as the 70 percent factor.

Figure 4: MUTCD warrants for the installation of pedestrian signal for four hour volumes



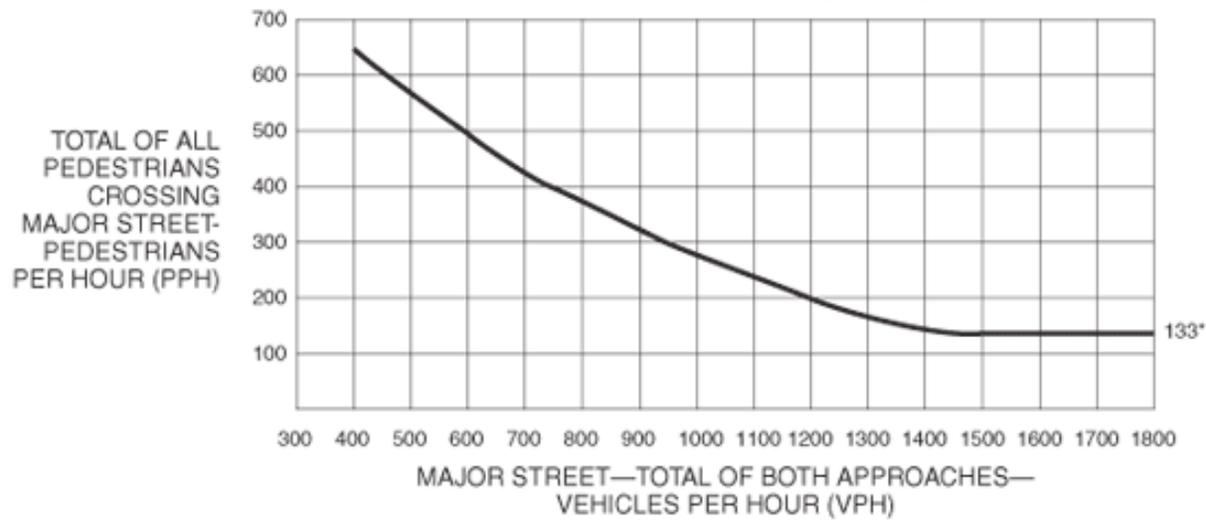
*Note: 107 pph applies as the lower threshold volume.

Figure 5: MUTCD warrants for the installation of pedestrian signal for four hour volumes (70 percent factor)



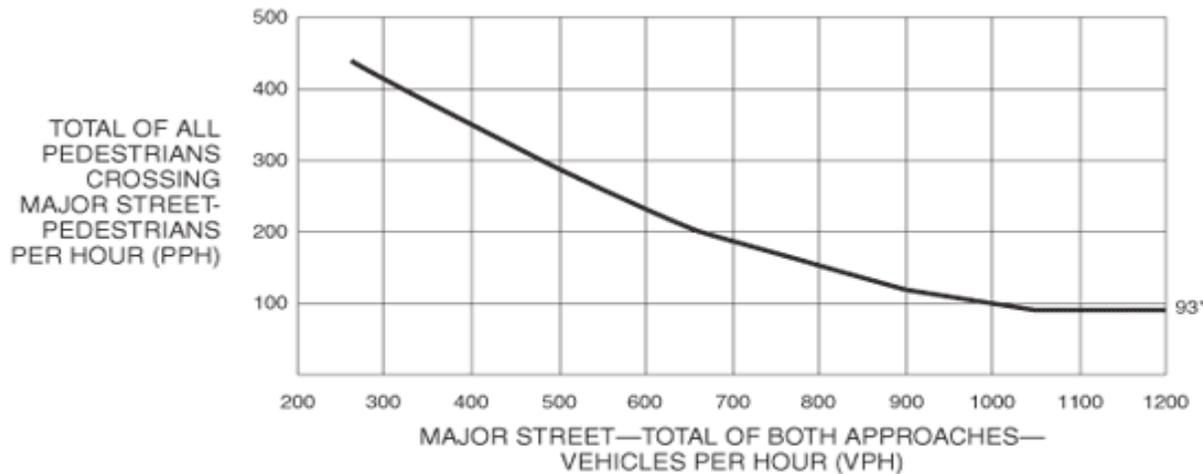
*Note: 75 pph applies as the lower threshold volume.

Figure 6: MUTCD warrants for the installation of pedestrian signal at peak hour



*Note: 133 pph applies as the lower threshold volume.

Figure 7: MUTCD warrants for the installation of pedestrian signal at peak hour (70 percent factor)



*Note: 93 pph applies as the lower threshold volume.

PEDESTRIAN DELAY OF LOS D OR WORSE

The pedestrian level of service calculator, according to the *Highway Capacity Manual 2010* methodology, calculates the level of pedestrian delay. This is determined based on the volume of vehicles and crossing distance. In other words, it measures how long pedestrians would have to wait to find a gap in traffic to safely cross the street. A level of service D, E or F corresponds to a delay of 20 seconds or greater.

The primary reason for this criterion is to prevent the overuse of marked crosswalks, to use them where they are most necessary in inducing yielding to create gaps for pedestrians to cross the street, and to not exceedingly increase the city's maintenance responsibility. Consideration should be given to exceptions to the level of service criteria where the pedestrian volume is at least twice the minimum threshold or where the crosswalk would serve a high proportion of vulnerable users.

LOCATION IS GREATER THAN 300 FEET FROM NEAREST CROSSING

Measure the distance from the proposed crosswalk to the nearest existing marked crosswalk, either controlled or uncontrolled. A distance of 300 feet or greater is necessary for a location to qualify to be considered for a marked crosswalk.

LOCATION MEETS SIGHT DISTANCE REQUIREMENTS

The American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets* (also known as the "Green Book") describes sight distance as "the length of the roadway ahead that is visible to the driver." Sight distance should be sufficient enough to allow for a vehicle traveling at the design speed to stop before reaching a stationary object. **Table 1**, from Chapter 3.2.2 of the AASHTO Green Book, shows the minimum sight distance required at various design speeds.

Table 1: Stopping sight distance on level roadways

Design Speed (mph)	Stopping Sight Distance (ft)
15	80
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495

CROSSING LEG IS PART OF A SIGNALIZED CORRIDOR

A signalized corridor is an arterial or collector road segment controlled by traffic signals in each direction along the uncontrolled intersection leg proposed to be crossed.

EXCEPTIONS TO CRITERIA

In some cases it may be reasonable to allow exceptions to the criteria identified above. Approval from the City Traffic Engineer is required for exceptions to these criteria. Any exceptions should be appropriately documented. Any situations which are not clearly defined by this guide should also be brought to the City Traffic Engineer for review and determination. The City Traffic Engineer will review locations that do not meet the MUTCD signal warrant but meet the criteria in the **Figure 1** flowchart to indicate that a marked crosswalk is appropriate, and **Table 2** indicates a Level C treatment.

The City may choose not to construct crosswalks or add devices that have a high cost that is not justified by the project's benefits.

Geometric Treatments

Before implementing a marked crosswalk, staff should evaluate the feasibility of:

1. Reducing travel speed along the corridor,
2. Narrowing or eliminating travel lanes,
3. Reducing the volume on the street, or
4. Other context appropriate traffic calming measures.

Implementing one or more of these modifications may affect whether or not a marked crosswalk is appropriate (per the process for evaluating candidate locations) or may reduce the level of crossing treatment necessary (for example, a Level A device instead of Level B per **Table 2**). If research indicates that vertical traffic calming such as speed humps are appropriate, crosswalk treatments may be combined with these measures to create raised crosswalks or raised intersections. In addition to these modifications, the following geometric treatments should be considered for proposed crosswalk installations:

PEDESTRIAN REFUGE ISLAND

Pedestrian refuge islands are located in the center of roadways, separating traffic of opposite directions, with a pedestrian path provided perpendicular to the roadway being crossed. Pedestrian refuge islands provide the opportunity for pedestrians to cross the street in two stages, finding gaps in traffic one direction at a time. Pedestrian refuge islands can be installed on roadways both with and without an existing two-way left-turn lane. Roadways without a two-way left-turn lane typically require lane transitions in advance of the medians and/or removal of parking.

SPLIT PEDESTRIAN CROSSOVER REFUGE ISLAND

The split pedestrian crossover median refuge island is similar to the traditional refuge island, except it is staggered in such a way that the pedestrian crosses half of

the roadway then turns within the median to walk towards oncoming traffic and then crosses the second half of the roadway. These treatments should be implemented instead of pedestrian refuge islands where the recommended treatment results in an uncontrolled marked crosswalk (Level A or Level B devices).

CURB EXTENSIONS

Curb extensions are elongations of the sidewalk that narrow the roadway. They both shorten the crossing distance for pedestrians and make pedestrians more visible to vehicles. Visually narrowing the roadway has also been shown to slow vehicular traffic.

PARKING PROHIBITION

In accordance with Denver Revised Municipal Code Section 54-458, parking is prohibited on a crosswalk, within 20 feet of a crosswalk, or 30 feet from a flashing beacon or traffic control signal. These restrictions should be implemented as appropriate with crosswalk markings or enhancements.

Crosswalk Treatments Guide

TREATMENT OPTIONS

Once it has been determined that a marked crosswalk should be installed based on the flowchart in **Figure 1**, the appropriate crosswalk treatment should be determined. There are three levels of treatment with varied levels of enhancement to the marked crosswalk. **Table 2** shows the level of treatment recommended for a location based on the number of lanes, average daily traffic and 85th percentile speed limit.

LEVEL A: MARKINGS AND SIGNING

The most basic treatment for a location that qualifies for a marked crosswalk is markings and signing only.

- Markings should be standard continental markings.
- Signing should be W11-2 (or S1-1 in a school zone) with W16-7p placards.
- On two and three lane roadways without a median, signs should be mounted at the roadside.

- Where a median is present the W11-2 (or S1-1 in a school zone) signs and W16-7p placards should be mounted both at the roadside and in the median.
- On multilane roadways, add advanced yield lines (20-50 feet in advance, as identified by the MUTCD) and R1-5 signs.

LEVEL B: RAPID RECTANGULAR FLASHING BEACON

Rapid Rectangular Flashing Beacons (RRFBs) are generally designated for locations with higher traffic volumes, higher traffic speeds, and more travel lanes.

- Markings should be standard continental markings.
- Signing should be W11-2 (or S1-1 in a school zone) with W16-7p placards.
- On two and three lane roadways without a median, signs and RRFBs should be mounted at the roadside.
- On multilane roadways where there is not a median present, add advanced yield

lines (20-50 feet in advance, as identified by the MUTCD), R1-5 signs and overhead RRFBs.

- Where a median is present, the W11-2 (or S1-1 in a school zone) signs and RRFBs should be mounted both at the roadside and in the median.
- RRFBs can be passively activated or activated with a push button.

LEVEL C: PEDESTRIAN HYBRID BEACON/ SIGNAL

Pedestrian hybrid beacons (PHBs) or traffic signals should be used where Level A or Level B devices are not effective for providing safe and efficient crossings.

MULTI-WAY STOP CONTROL

The City has a policy in place allowing multi-way stops at intersections on collector and local streets that are immediately adjacent to an elementary, middle or high school in order to provide additional pedestrian safety for school children. Marked crosswalks will also be installed at these multi-way stops. At

locations that are adjacent to a school where this document would otherwise suggest a Level A, B or C treatment, a multi-way stop may be an appropriate alternate treatment.

DECORATIVE CROSSWALKS

Decorative crosswalks should not be used instead of continental markings at uncontrolled crosswalks. An effectiveness study shows a statistically significant (37 percent) increase in safety with the use of continental crosswalks as compared to standard markings. This proven safety benefit of continental crosswalks defends the use of continental markings instead of decorative markings at uncontrolled crosswalks.

SIGNING

The signing associated with each level of treatment is described on the previous page. The signs are pictured below.

Because crosswalk locations have already met the sight distance requirements, as shown in **Table 1**, locations should therefore have the appropriate perception-reaction time (PRT). However, additional advanced signage can be provided where an engineering study or engineering judgment deems it necessary. It is important to avoid placing too many signs; research has shown that an overabundance of signs reduces their effectiveness.



W11-2



W16-7p



W11-15



W11-15p



S1-1



R1-5

TREATMENT SELECTION

Table 2 outlines which level of treatment to apply based on the average daily traffic, speed limit (assuming the speed limit is set at the 85th percentile speed) and number of travel lanes. Designations were determined

from compliance rates in related research and engineering judgement. Previously performed speed studies no more than two years old can be applied, as long as the location's conditions have not significantly changed.

When applying **Table 2** to one-way streets, double the location's number of lanes and ADT to find the appropriate treatment in the table. When applying **Table 2** at an uncontrolled intersection leg on a signalized corridor, the crossing treatment A should be upgraded to B.

Table 2: Recommended treatment at marked crosswalks

Roadway Type	Vehicle ADT ≤9,000			Vehicle ADT >9,000 to 12,000			Vehicle ADT >12,000 to 15,000			Vehicle ADT ≥15,000		
	≤30 mph	35 mph	40 mph	≤30 mph	35 mph	40 mph	≤30 mph	35 mph	40 mph	≤30 mph	35 mph	40 mph
Two Lanes	A	A	B	A	A	B	A	A	C	A	B	C
Three lanes	A	A	B	A	B	B	B	B	C	B	C	C
Multilane with raised median	A	A	C	A	B	C	B	B	C	C	C	C
Multilane without raised median	A	B	C	B	B	C	C	C	C	C	C	C

Notes:

- A= Level A, B= Level B, C= Level C
- Explore geometric treatments prior to the implementation of the treatment identified in the table.
- RRFBs should be side-mounted and median-mounted where median is present and side-mounted and overhead mounted where median is not present.

PRIORITIZATION

In 2016 Denver Public Works developed a prioritization methodology for uncontrolled intersections. The methodology factored in several criteria, relying mostly on crash data and network connectivity. For 2017, DPW is modifying the prioritization methodology. While still recognizing the importance of crash data, the approach will now emphasize pedestrian demand to better accommodate high levels of pedestrian activity with an enhanced crossing treatment.

Prioritization Criteria:

Pedestrian Volume

The minimum pedestrian volume for crosswalk installation is 20 pedestrians an hour. This scoring criteria will gradually increase as pedestrian volumes increase at the locations, as shown in the table 3.

Table 3: Pedestrian Volume

Pedestrians/ Hour	Score
20-29	2
30-39	4
40-49	6
50-59	8
60-69	10
70-79	12
80-89	14
90-99	16
100+	18

Crash Data

In the previous version, crash data primarily dictated a location's score. Going forward, locations with crashes involving pedestrians or bicyclists will be weighted for priority, while still allowing for locations with high amounts of crashes to be factored.

Table 4: Crash Data

Crash Type	Score
Bike/Ped	5
Vehicle	0.1

Distance to Crossing

One major obstacle to pedestrians is the distance between traffic controlled intersections. Uncontrolled intersections that are further away from a traffic controlled intersection will receive higher priority.

Table 5: Distance to Crossing

Distance from Controlled Intersection (ft)	Score
300-499	2
500-699	4
700-899	6
900-1099	8
1100-1299	10
1300+	12

Bikeway Connectivity

Uncontrolled intersections negatively impact bicyclist mobility as well as pedestrians. Uncontrolled intersections that intersect with a Denver Bikeway will receive additional scoring to improve the functionality of the city's bicycle network.

Table 6: Bikeway Connectivity

Bike Connectivity (y/n)	Score
Yes	5
No	0

Denver Moves: High Pedestrian Demand Index

The Denver Moves Pedestrians planning effort is currently underway and will be identifying areas of the city, that given their unique geographic and demographic factors, will typically support higher levels of pedestrian activity and mobility. To better accommodate pedestrian mobility in these areas, uncontrolled intersections that fall within High Pedestrian Demand areas will receive additional scoring.

Table 7: Pedestrian Demand

High Pedestrian Demand Area (y/n)	Score
Yes	5
No	0

Public Input

In the event that there are several locations in the same geographic area with comparable scores, Public Input can serve as a tie breaker or method of project escalation where necessary.

Glossary

AASHTO American Association of State Highway and Transportation Officials

ADA Americans with Disabilities Act

CRS Colorado Revised Statutes

DRMC Denver Revised Municipal Code

HCM Highway Capacity Manual

MUTCD Manual on Uniform Traffic Control Devices

NACTO National Association of City Transportation Officials

PHB Pedestrian Hybrid Beacon

RRFB Rapid Rectangular Flashing Beacon

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