

MEMORANDUM

Date: 9/13/2016

Re: Citywide Crosswalk Policy



CITY OF
MENLO PARK

Foreword

Through the City of Menlo Park's Circulation Element and Complete Streets Policy, it is the City's goal to promote walking trips and provide safe facilities to safely accommodate pedestrian travel within the public right of way. The City has acknowledged the benefits and values for the public health and welfare of reducing vehicle miles traveled and increasing transportation by walking, bicycling, and public transportation. According to national collision statistics from the Federal Highway Administration, nearly three-quarters of pedestrian collisions occur at locations with no traffic controls (i.e., a stop sign or traffic signals). Therefore, having an adopted City policy to define where, when, and how to treat crossings is important to maximize safety of people walking.

This document provides guidelines to select appropriate locations and identify appropriate treatments for crosswalks within Menlo Park. These guidelines document best practices, but are subject to the application of engineering judgement on a case-by-case basis. They are not meant to supplant the California Manual on Uniform Traffic Control Devices (CA MUTCD), which should also be consulted by practitioners involved in the installation of crosswalks.

Background

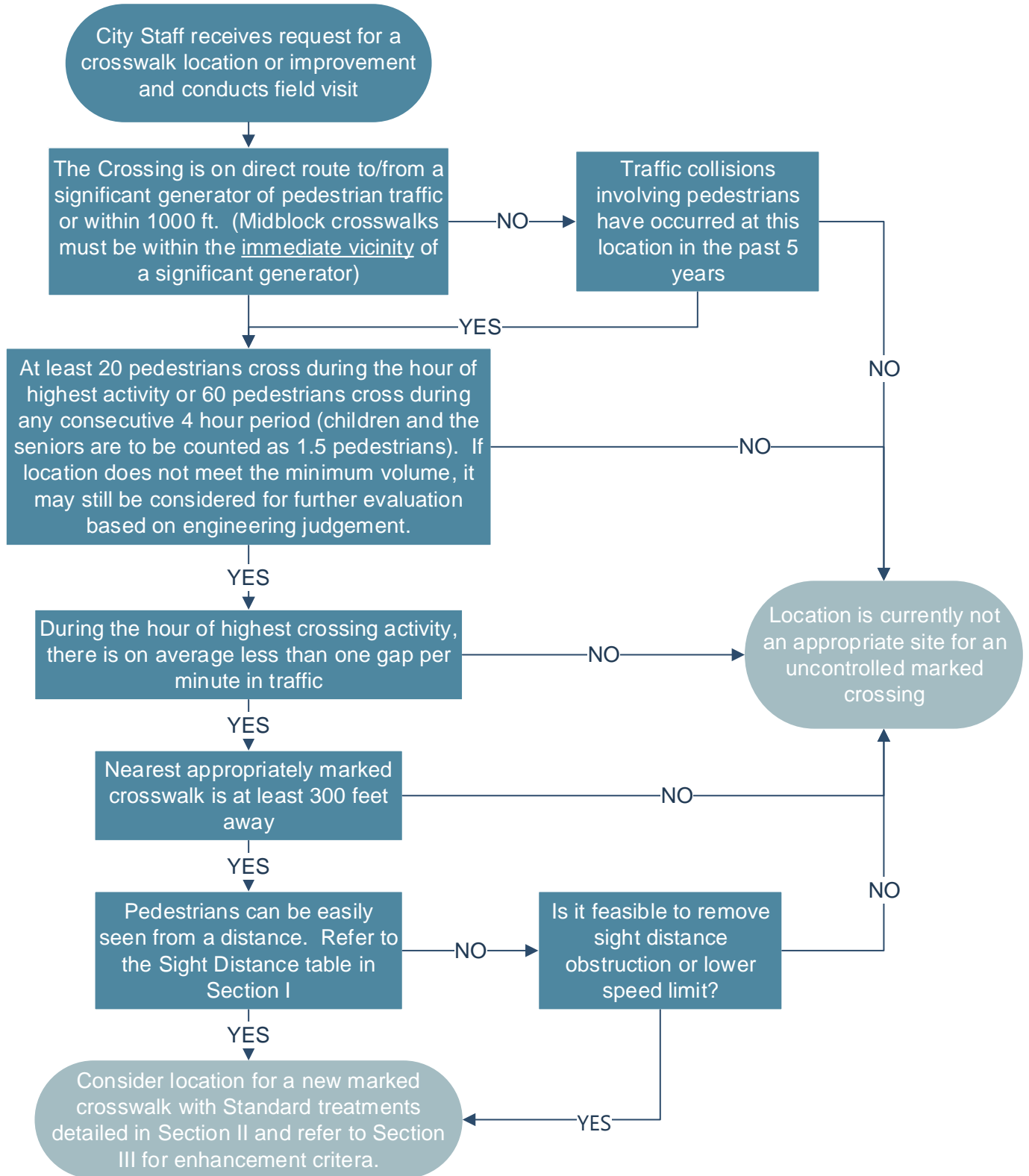
According to the California Vehicle Code (CVC), a crosswalk is the area of roadway included within the extension of the sidewalk boundary lines at intersections of roadways that meet at approximately right angles. Crosswalks can be unmarked or marked at both intersections and occasionally midblock locations. They may also be uncontrolled or controlled with a stop sign or signal.

Crosswalks may be installed to help pedestrians cross and channelize them to a designated crossing area. It is the intent of the City to install marked crosswalks at locations where the Transportation Manager, in the exercise of his/her engineering judgment, determines that such installation is appropriate. Marked crosswalks should not be used indiscriminately and considered when there is a need demonstrated by an engineering study.

Marked crosswalks designate a place where pedestrians needing to cross the road can be expected and seen by motorists. Even though CVC section 21950 requires that motorists yield to pedestrians crossing within a crosswalk, the CVC also holds pedestrians responsible for crossing with due care for his/her safety. The crosswalk installation flow chart on page 2 of this document is to be used by City staff for public requests relating to crosswalks to consistently guide installation and enhancement recommendations. More detailed information about the flow chart is presented in the following sections.

The guidance in this document has been written to enable staff to exercise sound judgement when applying it. The flexibility allows for a tailored design, as appropriate, for the specific circumstances of the differing location while maintaining safety.

Section I. When to Install Crosswalk Markings



Calculate **Crossing Time** = Crossing Distance (ft.) / Walking Speed (*3.0 ft. /sec)

* 2.8 ft. /sec in places where elderly pedestrians regularly use the crosswalk

Record for 60 minutes, the **Total available gap time****= time from rear bumper of first car to the front bumper of the next car.

Only include the time of gaps that are greater than the **crossing time.

Available gaps = **Total available gap time** / **Crossing Time**

$$\text{Average \# of Gaps } \left(\frac{\text{gaps}}{\text{min}} \right) = \frac{\text{Available gaps}}{60 \text{ minutes}}$$

Sight Distance

According to AASHTO, sight distance is the length of the roadway ahead that is visible to the driver. The available sight distance on a roadway should be sufficiently long to enable a vehicle travelling at or near the design speed to stop before reaching a stationary object in its path. Although greater lengths of visible roadway are desirable, the distance at every point along a roadway should be at least that needed for a below-average driver or vehicle to stop. Stopping sight distances for various speeds on level roadways are shown in the following table:

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

Source: 'A Policy on Geometric Design of Highways and Streets' (AASHTO's Green Book)

Any trees, shrubs and vegetation that block street lights and visibility of warning signs shall be noted during the investigation and trimmed, if needed, if a crosswalk is to be installed.

Section II. Standard New Uncontrolled Crosswalks

Yield Lines

Yield lines consist of a row of solid white isosceles triangles pointing toward approaching vehicles extending across approach lanes to indicate the point at which the yield is required to be made in compliance with a YIELD sign. They should be used at all crosswalks that cross uncontrolled multi-lane approaches. The yield lines should be placed 20 to 50 feet in advance of the nearest crosswalk line, and parking should be prohibited in the area between the yield line and the crosswalk. If a yield line is used, the Yield Here to Pedestrians (R1-5) sign shall be installed as close as possible to the yield line.

Parking Restrictions adjacent to Crosswalks

As necessary, an evaluation will be made whether, and to what extent, parking restrictions are necessary adjacent to the crosswalk. Parking restrictions may be accomplished through either the installation of red curbs or signage. The amount of parking restrictions needed is dependent upon:

- the location of the crosswalk
- street geometry, sight distances and traffic conditions
- proximity to schools, parks and other pedestrian generators
- vehicular speed
- crash history
- traffic controls
- area traffic patterns

Each warranted crosswalk location will be evaluated to determine the extent of parking restrictions needed, if any. Each crosswalk location will be studied on a case-by-case basis to determine the length of the parking restriction required, and whether red curb or no parking/stopping signs are appropriate. If parking restrictions are not necessary, the reason for that determination will be documented as part of the engineering investigation. The parking removal process shall be consistent with Section 11.24 of the City of Menlo Park Ordinance.

Accessibility

To comply with Title II of the Americans with Disabilities Act, curb ramps shall be provided at new marked crosswalks to allow people with disabilities to cross streets safely. The curb ramps shall be constructed according to the most recent Caltrans standards with brick red detectable warning surfaces except for school areas which will have yellow detectable warning surfaces.

Signs and Markings

The MUTCD (W11-2) pedestrian crossing sign is a Non-Vehicular Warning sign that is used to alert road users in advance of locations where pedestrians may be present and shall be installed for all uncontrolled, marked crosswalks. At new locations, a pedestrian crossing (W11-2) warning sign with downward pointing arrow (W16-7p) plaque shall be placed facing traffic on both sides of the crosswalk and should be double sided. A pedestrian crossing (W11-2) warning sign and AHEAD (W16-9p) supplemental plaque may be placed in advance of the marked crosswalk in locations that have low visibility. Existing locations should be retrofit during regular maintenance or street resurfacing.

Crosswalk markings delineate and alert road users of where pedestrians are to cross. They should be at least 10 feet wide clear and extend across the full width of pavement or to the edge of the intersecting crosswalk to discourage diagonal walking between crosswalks. Continental-style markings with 2-foot longitudinal white lines every 4 feet shall be used at new uncontrolled locations. Existing uncontrolled crosswalks should be enhanced with ladder crosswalk markings when the roadway is restriped and changed to a continental crosswalk when the street is resurfaced. White "PED XING" pavement markings

may be placed in each approach lane to a marked crosswalk, except at intersections controlled by traffic signals or STOP or YIELD signs.

Markings at controlled locations shall include two parallel lines, but not high visibility markings, so that their effectiveness is preserved for uncontrolled locations. Markings at controlled locations may be enhanced on designated safe routes to school paths.

Marked School Crosswalks

The placement of school crosswalks (yellow) should comply with the guidelines set forth in the MUTCD. School crosswalks shall use the School (S1-1) sign in place of the pedestrian crossing (W11-2) sign, yellow crosswalk markings in place of the white markings, and the yellow “SLOW SCHOOL XING” pavement marking in place of the “PED XING” pavement marking.

Community Education

As apart any new uncontrolled crosswalk, additional measures should be taken to inform roadway users of the installation. Double sided flags should be placed on the pedestrian crossing (W11-2) signs and Changeable Message Signs should be deployed where there is available space along the side of the roadway.

New Developments

In general, new developments shall install adequate pedestrian facilities to accommodate any future demand generated by the project. This includes but is not limited to sidewalks, crosswalk markings, signage, roadway striping and necessary enhancements as determined by the Transportation Manager.

Appeals

If an uncontrolled location is determined to not be an appropriate site for a marked uncontrolled crossing based on the criteria set forth in Section I, it may still be considered for further evaluation on a case-by-case basis by the Transportation Manager. Appeals would be considered by the Public Works Director.

Section III. When to Enhance a Marked Crosswalk

Crosswalk Enhancements

There are conditions where the placement of a marked crosswalk alone may not make the crossing any more visible, and may not result in improved safety. In these cases, enhancements beyond installation of markings alone shall be required. The Federal Highway Administration (FHWA) identified such locations in its 2005 study titled “Safety Effects of Marked versus Unmarked Crosswalks at Uncontrolled Locations”. Table 1 of the FHWA study categorizes locations based on roadway type, average daily traffic, speed and should be used to determine whether a crosswalk should be enhanced. This table is included on the following page.

Locations categorized as P or N from Table 1 should not be installed without enhancements appropriate for site-specific conditions. The Crosswalk Enhancement Toolbox on page 7 lists the strategies available, including signs, striping techniques and devices that enhance visibility of the crossing like beacons or warning lights. It is the City’s intent to use those enhancements that have a demonstrated effectiveness where they will materially increase pedestrian safety. The City Transportation Manager will consider the overall effect of the potential mitigation measure in the determination of the placement of a marked crosswalk.

While this policy is designed to apply to new crosswalk requests and installations, the City may also use this guidance to evaluate and prioritize enhancements to existing marked crosswalks.

Table 1. Recommendations for installing marked crosswalks and other needed pedestrian improvements at uncontrolled locations.*

Roadway Type (Number of Travel Lanes and Median Type)	Vehicle ADT ≤ 9,000			Vehicle ADT >9,000 to 12,000			Vehicle ADT >12,000–15,000			Vehicle ADT > 15,000		
	Speed Limit**											
	≤ 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	C	C	P	C	C	P	C	C	N	C	P	N
Three lanes	C	C	P	C	P	P	P	P	N	P	N	N
Multilane (four or more lanes) with raised median***	C	C	P	C	P	N	P	P	N	N	N	N
Multilane (four or more lanes) without raised median	C	P	N	P	P	N	N	N	N	N	N	N

* These guidelines include intersection and midblock locations with no traffic signals or stop signs on the approach to the crossing. They do not apply to school crossings. A two-way center turn lane is not considered a median. Crosswalks should not be installed at locations that could present an increased safety risk to pedestrians, such as where there is poor sight distance, complex or confusing designs, a substantial volume of heavy trucks, or other dangers, without first providing adequate design features and/or traffic control devices. Adding crosswalks alone will not make crossings safer, nor will they necessarily result in more vehicles stopping for pedestrians. Whether or not marked crosswalks are installed, it is important to consider other pedestrian facility enhancements (e.g., raised median, traffic signal, roadway narrowing, enhanced overhead lighting, traffic-calming measures, curb extensions), as needed, to improve the safety of the crossing. These are general recommendations; good engineering judgment should be used in individual cases for deciding where to install crosswalks.

** Where the speed limit exceeds 40 mi/h, marked crosswalks alone should not be used at unsignalized locations.

*** The raised median or crossing island must be at least 4 ft wide and 6 ft long to serve adequately as a refuge area for pedestrians, in accordance with MUTCD and American Association of State Highway and Transportation Officials (AASHTO) guidelines.

C = Candidate sites for marked crosswalks. Marked crosswalks must be installed carefully and selectively. Before installing new marked crosswalks, an engineering study is needed to determine whether the location is suitable for a marked crosswalk. For an engineering study, a site review may be sufficient at some locations, while a more in depth study of pedestrian volume, vehicle speed, sight distance, vehicle mix, and other factors may be needed at other sites. It is recommended that a minimum utilization of 20 pedestrian crossings per peak hour (or 15 or more elderly and/or child pedestrians) be confirmed at a location before placing a high priority on the installation of a marked crosswalk alone.

P = Possible increase in pedestrian crash risk may occur if crosswalks are added without other pedestrian facility enhancements. These locations should be closely monitored and enhanced with other pedestrian crossing improvements, if necessary, before adding a marked crosswalk.

N = Marked crosswalks alone are insufficient, since pedestrian crash risk may be increased by providing marked crosswalks alone. Consider using other treatments, such as traffic-calming treatments, traffic signals with pedestrian signals where warranted, or other substantial crossing improvement to improve crossing safety for pedestrians.

(Source: *Safety Effects of Marked versus Unmarked Crosswalks at Uncontrolled Locations, Table 11, FHWA*)

Crosswalk Enhancement Toolbox

High-Visibility Signs and Markings



Image source: mutcd.fhwa.gov



Image source: walkboston.blogspot.com

Description: High-visibility markings include a family of crosswalk striping styles such as the “ladder”. High visibility fluorescent yellow green signs are made of the approved fluorescent yellow green color and posted at crossings to increase the visibility of a pedestrian crossing.

Benefits: Marked crosswalks provide a designated crossing, which may improve walkability by signaling a clear “channel” for pedestrian pathways to both pedestrians and vehicles. High visibility signs attract drivers’ attention to areas of potential pedestrian conflict.

Application: Shall be used with all new uncontrolled crosswalk installations. Refer to page 4 for more information about signs and markings.

Advanced Yield Lines



Image source: pedbikesafe.org

Description: Standard yield lines are placed in advance of marked, uncontrolled crosswalks. Yield lines indicate where the driver is required to yield.

Benefits: This measure increases the pedestrian’s visibility to motorists, reduces the number of vehicles encroaching on the crosswalk, and improves general pedestrian conditions on multilane roadways.

Application: Yield lines should be used at all crosswalks that cross uncontrolled multi-lane approaches.

Curb Extension/Bulb Outs



Image source: nacto.org

Description: Also known as a pedestrian bulb-out, this traffic-calming measure is meant to increase the pedestrian space, driver awareness of pedestrians and has also been shown to calm traffic. It consists of an extension of the curb into the street, shortening pedestrian crossing distances.

Benefits: Curb extensions narrow the distance that a pedestrian has to cross and increases visibility of pedestrians attempting to cross at street corners.

Application: Due to the high cost of installation, this tool would only be suitable on streets with high pedestrian activity, on-street parking, and infrequent (or no) curb-edge transit service. It is often used in combination with crosswalks or other markings.

Rectangular Rapid Flashing Beacons



Image source: carmanah.com

Description: Rectangular Rapid Flash Beacons (RRFB) are user-actuated amber LEDs that supplement warning signs and are meant to alert motorists of crossing pedestrians at uncontrolled crossings (unsignalized intersections and mid-block crosswalks).

Benefits: The nature of the flash pattern may elicit a greater response from drivers and have been shown to significantly increase yielding rates compared to standard pedestrian warning signs alone.

Application: If used, RRFBs shall be installed on both the right and left sides of the roadway and should be double-sided. The addition of RRFB may increase safety effectiveness of other treatments, such as advance yield markings with YIELD HERE FOR PEDESTRIAN signs.

Median Pedestrian Island



Image source: calmstreetsboston.blogspot.com

Description: Raised islands are placed in the center of a roadway, separating opposing lanes of traffic with cutouts for accessibility along the pedestrian path.

Benefits: This measure allows pedestrians to focus on each direction of traffic separately, and the refuge provides pedestrians with a better view of oncoming traffic as well as allowing drivers to see pedestrians more easily. It can also split up a multi-lane road and act as a supplement to additional pedestrian tools.

Application: Recommended for multi-lane roads wide enough to accommodate an ADA-accessible median.

In-Street Pedestrian Crossing Signs



Image source: clrp.cornell.edu

Description: This measure involves posting regulatory pedestrian signage on lane edge lines and road centerlines. The In-Street Pedestrian Crossing sign may be used to remind road users of laws regarding right of way at an unsignalized pedestrian crossing. The legend STATE LAW is shown at the top of the sign.

Benefits: This measure is highly visible to motorists and has a positive impact on pedestrian safety at crosswalks

Application: Mid-block crosswalks, unsignalized intersections, low-speed areas, and two-lane roadways are ideal for this pedestrian treatment.

Pedestrian Hybrid Beacon



Image source: fhwa.dot.gov

Description: Pedestrian Hybrid Beacons (PHB) are pedestrian-actuated devices that are a combination of a beacon flasher and a traffic control signal. When actuated, PHB displays a yellow (warning) indication followed by a solid red light. During pedestrian clearance, the driver sees a flashing red “wig-wag” pattern until the clearance interval has ended and the signal goes dark.

Benefits: Reduces pedestrian-vehicle conflicts and slows traffic speeds.

Application: Useful in areas where it is difficult for pedestrians to find gaps in automobile traffic to cross safely, but where normal signal warrants are not satisfied. Appropriate for multi-lane roadways. A warrant analysis is required prior to consideration of a PHB and implementation may be further limited by available budget.