

January 14, 2014

Jill Barnes, P.E., Director of Public Works
City of Mill Valley
26 Corte Madera Avenue
Mill Valley CA 94941

Subject: City of Mill Valley Uncontrolled Crosswalk Policy

Dear Ms. Barnes:

Pursuant to your request, Parisi Transportation Consulting has developed the following Uncontrolled Crosswalk Policy for the City of Mill Valley. This letter serves to describe the design policy considerations at uncontrolled crosswalks, summarize standard treatments and their conditions for application, and describe supplemental countermeasures and conditions that may warrant their use.

Purpose of Uncontrolled Crosswalk Policy

Uncontrolled crosswalk locations may exist at an intersection with no stop signs or signals, at intersections with a minor stop sign but no control on the major through street, and at mid-block locations between intersections. Marked crosswalks are a tool to designate where pedestrians should cross a street, but in most cases are best when used in combination with other treatments to clearly designate the crossing. Per the California Manual on Traffic Control Devices (MUTCD), uncontrolled marked crosswalks should be considered at:

- Locations "to help alert road users of a designated pedestrian crossing point across roadways at locations that are not controlled by traffic control signals or STOP or YIELD signs" when installed "in conjunction with signs and other measures." (§3B.18)
- "Non-intersection locations [to] legally establish the crosswalk." (§3B.18)
- "All intersections on established routes to a school where there is substantial conflict between motorists, bicyclists, and student movements; where students are encouraged to cross between intersection; where students would not otherwise recognize the proper place to cross; or where motorists or bicyclists might not expect students to cross." Moreover, "whenever a marked pedestrian crosswalk has been established in a roadway contiguous to a school building or school grounds, it shall be yellow." (§7C.02)

Note however, that the California MUTCD does not necessarily consider marked crosswalks alone as a sufficient treatment. The California MUTCD dictates that an engineering study should

be performed prior to installing a crosswalk at an uncontrolled location, and should consider the number of lanes, the pedestrian volumes and delays, the average daily traffic (ADT), speed limit, and other appropriate factors.

A comprehensive study by the Federal Highway Administration (FHWA) definitively showed that at an uncontrolled location marked crosswalks alone were not associated with a significantly lower pedestrian crash rate than an unmarked crosswalk.ⁱ Furthermore, on multilane roads (i.e., roads with two or more lanes in each direction) with more than 12,000 vehicles per day, having only a marked crosswalk was associated with a higher pedestrian crash rate, after controlling for other site factors. As such, careful consideration must be paid when proposing an unmarked crosswalk and oftentimes more substantial improvements are needed, like additional traffic signs and pavement markings, raised medians/refuge islands, speed-reducing measures, and/or other practices.

Conditions Precluding Marked Crosswalks at Uncontrolled Locations

Per California MUTCD §3B.18, marked crosswalks alone are not recommended at locations with the following conditions due to the degree of pedestrian exposure to traffic, driver stopping distance at high speeds, and pedestrian crash severity.

- Where the speed limit exceeds 40 mph and either:
 - On a roadway with four or more lanes without a raised median or crossing island than has an ADT of 12,000 or greater
 - On a roadway with four or more lanes with a raised median or crossing island than has an ADT of 15,000 or greater

Enhanced crossing treatments (e.g., traffic calming treatments, traffic and pedestrian signals or beacons, and other substantial improvements) are recommended instead.

Standard Treatments at Uncontrolled Crosswalks for Single Lane Roads

At uncontrolled locations marked crosswalks indicate preferred locations for pedestrians to cross and help designate right-of-way for motorists to yield to pedestrians. Marked crosswalks should not be installed in close proximity to traffic signals, since pedestrians should be encouraged to cross at the signal. The minimum distance from a signal for installing a marked crosswalk should be determined per the City's discretion. FHWA guidance is for higher priority to be placed on locations having a minimum of 20 pedestrian crossings per peak hour or 15 or more elderly and/or child pedestrians. However, in all cases good engineering judgment must be applied.

The following presents standard treatments at uncontrolled crosswalks in order of escalating priority and cost. The City should consider these treatments as a progression until the crossing is adequately mitigated.

Treatment	Notes
Curb ramps	Curb ramps must be installed at all intersections and midblock locations where pedestrian crossings exist, as mandated by the Americans with Disabilities Act of 1990.
High-visibility crosswalk markings	Marking materials like thermoplastic are highly reflective, long-lasting, and slip-resistant. Dense marking patterns like zebra patterns provide improved visibility over standard crosswalk markings.
Warning signs and pavement stencils	Pedestrian and school warning signs shall conform to California MUTCD standards by using a fluorescent yellow-green background with a black legend. Signs with arrows shall be placed at the crosswalk location. Signs with AHEAD shall be placed in advance of the crosswalk. Pavement stencils such as PED XING and SLOW SCHOOL XING shall be installed on the street surface.
Roadway lighting	Pedestrian scale lighting is necessary to alert motorists to stop in low-light conditions.

Supplemental Treatments at Uncontrolled Crosswalks for Multi-lane Roads

Uncontrolled crosswalks on multi-lane roadways represent a greater design challenge because of potential multiple threat conditions. A multiple threat crash involves a vehicle stopped in one lane to yield to a pedestrian with an oncoming vehicle in the adjacent same-direction lane striking the pedestrian crossing in front of the stopped vehicle. This crash type can involve both the pedestrian crossing and the driver failing to see each other in time.

The following presents supplemental treatments to mitigate the multiple threat condition at multi-lane roadway crossings. These treatments should be used in conjunction with the countermeasures presented in the prior table.

Treatment	Notes
Advance yield lines with supplemental signs (e.g., "Yield Here for Crosswalk")	Advance yield lines located 20 to 50 feet in advance of the crosswalk can improve the visibility of pedestrians to drivers in both lanes of approaching traffic. Signs can be located adjacent to the yield line.
Rectangular Rapid Flashing Beacons (RRFB)	Actuated crossing beacons can provide advance notice to drivers in conditions where a full traffic signal is not warranted per California MUTCD standards. RRFBs should be considered only for roadways with a speed limit over 30 mph and/or multi-lane roads when peak

	pedestrian volumes are greater than 20 pedestrians per hour and peak conflicting traffic volumes are greater than 800 per hour, or when based on engineering judgment by the Public Works Department.
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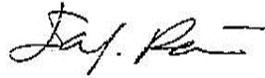
Additional Treatments to Consider

The following presents a discussion of additional crosswalk countermeasures that the City may choose to supplement the treatments presented in the prior two sections. Implementation of one or more of these measures should only be considered after installation of the above treatments and based on monitoring and/or engineering judgment by the Public Works Department.

Treatment	Notes
In-Street "Yield to Pedestrians" signs	Reminds drivers the laws regarding right-of-way at an unsignalized pedestrian crosswalk. Per California MUTCD guidelines, the in-street sign is placed at the crosswalk location at the center line, and therefore should be used in conjunction with a standard advance warning sign. Does not mitigate the multiple threat condition and therefore should not be used on a multi-lane road or on roadways with a speed limit of > 30 mph.
Parking prohibitions	Used to improve pedestrian visibility at crossings. Per California MUTCD §3B.19, all intersections should have one stall length on each side measured from the crosswalk or end of curb return should have parking prohibited. Additional parking prohibitions can be used as necessary to improve pedestrian visibility.
Refuge islands	Raised curb provides a safe waiting area for pedestrians to await gaps in traffic for a single direction at a time.
Traffic calming measures, such as curb extensions and lane reductions	More costly and longer time to implement compared to standard treatments. Refer to Mill Valley Neighborhood Traffic Calming Program for further guidance.

Please let me know if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "D. Parisi". The signature is fluid and cursive, with a horizontal line extending from the end.

David Parisi, PE, TE
Principal

cc: Andrew Lee, TE/PTC

¹ Zegeer, Stewart, Huang, Lagerwey, Feaganes, and Campbell (2005) *Safety Effects of Marked versus Unmarked Crosswalks at Uncontrolled Locations: Final Report and Recommended Guidelines*. FHWA-HRT-04-100.