Marking and Signing Crosswalks

A marked crosswalk can benefit pedestrians by directing them to cross at locations where appropriate traffic control, including traffic signals or adult school crossing guards, either currently exist or can be provided. However, marked pedestrian crosswalks, in and of themselves, do not slow traffic or reduce pedestrian crashes.

It may be helpful to install marked crosswalks at signalized intersections or locations where crosswalks are typically marked, at key crossings in neighborhoods with designated school walking routes, and at certain types of uncontrolled crossings.

Image: A marked crosswalk guides students along the school walking route to Ocoee Elementary School in Orlando, Florida.

There are several reasons to install marked crosswalks, a few being:

- To indicate a preferred pedestrian crossing location.
- To alert drivers to an often-used pedestrian crossing.
- To indicate school walking routes.

Click on a link to learn more about:

Marked Crosswalks at Uncontrolled Crossings

Marked crosswalks at uncontrolled locations must be carefully selected and designed to ensure that they enhance, rather than reduce, pedestrian safety. In some circumstances marked crosswalks should not be installed unless supplemental measures are taken to reduce traffic speeds, shorten crossing distances, enhance driver awareness, and/or provide an active warning of pedestrian presence.

Marked crosswalks alone (without other substantial treatments) should not be installed across uncontrolled roadways where the speed limit exceeds 40 mph or either:

- 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
- 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.
  Note: The wording above complies with the 2013 Traffic Control Device Handbook, Chapter 13." The exact wording in the 2009 MUTCD on this issue is currently worded slightly differently and is being considered for revision by FHWA.

Marked crosswalks generally should be designed to minimize crossing distances and should be straight and in line with the sidewalk ramps to make them easier for children and adults with visual and/or physical impairments to navigate.

In many cases, crosswalk enhancements including raised median islands, traffic and pedestrian signals and/or street lighting may also be needed. More substantial improvements are typically needed on high-volume multilane roads.

Treatment: Marked Crosswalks

Description/Purpose
Marked crosswalks are painted pedestrian crossings that specify proper locations for pedestrians to cross the street.

Expected Effectiveness
Properly placed marked crosswalks can encourage pedestrians to walk at preferred crossing locations while increasing the visibility of and driver awareness of a pedestrian crossing location. There is, however, no proven reduction in pedestrian crashes resulting from marking crosswalks without adding other more substantial crossing treatments such as raised medians, traffic and pedestrian signals or improved nighttime lighting.

Costs
Costs range from an average of approximately $750 for a striped crosswalk to nearly $2,600 for a high visibility crosswalk (Bushell, Poole, Zegeer, Rodriguez, 2013). Maintenance costs should also be considered based on the paint material used.

Keys to Success:
- Locations chosen to have marked crosswalks should be convenient, accessible and in the direct pedestrian route [AASHTO, 2004]. For more information see the Institute of Transportation Engineers Traffic Control Devices Handbook, 2013 and Zegeer, 2002.

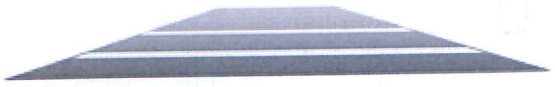
Key Factors to Consider:
- On multi-lane, high- volume roads (e.g., roads with three or more lanes combined with 12,000 or more vehicles per day), substantial treatments including raised medians are also needed so pedestrian crash risks do not increase.
- Crosswalk markings must be placed so that the curb ramp is within the crosswalk.

Evaluation Measures:
- Reduction in motor vehicle conflicts and increase in pedestrian activity within the crosswalk.

High-Visibility Crosswalks

Marked crosswalks guide pedestrians and alert drivers to a crossing location, so it is important that both drivers and pedestrians clearly see the crossings. Crosswalks can be marked in paint or a longer lasting plastic or epoxy material embedded with reflective glass beads. Although more expensive, longer-lasting, high-visibility crosswalk marking materials are a better value over time as they require less maintenance.

The minimum crosswalk width is six feet wide but should be wider at crossings with high numbers of pedestrians. School-related crosswalks should be checked annually before the start of the school year. If necessary, fresh paint should be applied and other improvements made to keep the crosswalks in good condition.



Crosswalk A is a traditional parallel line crosswalk.

The 2009 MUTCD allows for two basic types of crosswalk designs, such as (1) traditional parallel lines; or (2) a high-visibility crosswalk pattern, such as a

ladder, continental design, or diagonal marking. (See 2009 MUTCD, page 384.)

Crosswalk B is high-visibility crosswalk with a ladder design.

In-Street Signs

In-street crosswalk signs must be installed at uncontrolled pedestrian crossings to make the crosswalk more visible and increase drier yielding. They are more likely to be effective on two-lane, low-speed streets than on multi-lane, high-speed streets, and are prohibited by the 2009 MUTCD at signalized intersections. They can be easily damaged and need to be reset or replaced when damaged.

In-street pedestrian crossing signs should be placed at the crosswalk in the street or on a median, but should not obstruct the pedestrian path of travel. In-street signs can be permanently installed in the roadway or mounted on a portable base to allow them to be taken in and out of the street as needed. When portable in-street signs are used for school crossings, they should be monitored by a school official or adult school crossing guard.

Each state's laws must be consulted to see if the "Stop For" or "Yield To" sign is appropriate for use.

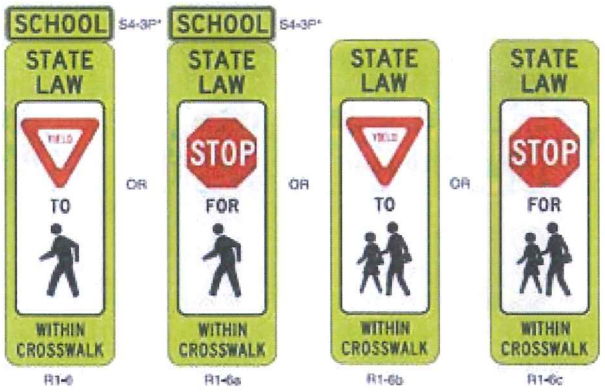


Figure 1: In-street yield and and stop signs. The 2009 MUTCD added a new option to use the schoolchildren symbol rather than the pedestrian symbol when an in-street sign is used at a school crossing. Image from the 2009 MUTCD.

Overhead signs and flashing beacons

School crosswalks with overhead signs (and sometimes flashing beacons) may be helpful in alerting drivers of a busy crossing at a wide or higher speed street. These are usually placed at mid-block crossings but can be used at intersections with uncontrolled crossings. Overhead signs are easier for drivers to see in cases where on-street parking, street trees, or other visual obstructions exist. Flashing beacons at a marked crosswalk may draw additional attention to the crosswalk. The beacons can be set with a timer to flash only during crossing times, or can be pedestrian-activated by an automatic detector or push button such that they only flash when pedestrians are present. In other locations the beacons are set with a timer to flash only during crossing times, or are pedestrian-activated by an automatic detector or push button and only flash when pedestrians are present.

Figure 2: Overhead pedestrian crossing sign. The 2009 MUTCD allows the use of the schoolchildren symbol as shown in the modified image above. Image from the 2009 MUTCD.

Various school warning signs are also available for use in school areas. These signs include school advances signs to alert motorists that they are entering a school zone where children are present. A school crossing sign at the crosswalk should have a down arrow. School speed limit signs (e.g., "School: Speed Limit 20") may also be use to give advance warning to motorists to slow down as they enter the school zone. Examples of such school zone signing are illustrated below (Figure 3).

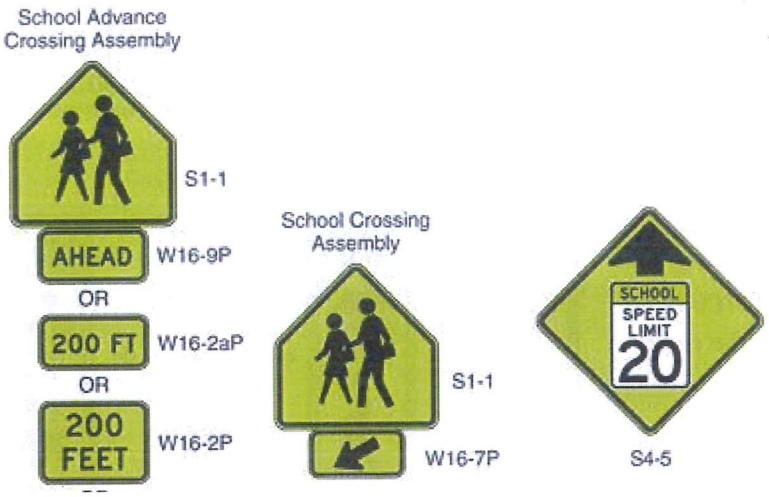


Figure 3.

Rectangular Rapid Flashing Beacon

Rectangular rapid flashing beacons (RRFBs) are active warning devices used to alert motorists of crossing pedestrians at uncontrolled crossings. They remain dark until activated by pedestrians, at which point they emit a bright, rapidly flashing yellow light .

Studies suggest that RRFBs can significantly increase yielding rates compared to standard pedestrian warning signs alone. Results have shown that motorist yielding can be increased from baselines averaging 5% to 20% with the standard pedestrian warning sign treatment only to sustainable yielding rates of 80% or higher with this device.

RRFBs shall be installed on both the right and left sides of the roadway. They are not currently included in the MUTCD, but jurisdic tions can use them if they obtain approval from FHWA, under the terms and conditions of Interim Approval II (see section IA.10 of the MUTCD).

Image: Provided by PBIC Designing for Pedestrian Safety Course.

In-pavement Flashers

Crosswalks with in-pavement flashers can be expensive to install and maintain, and should only be selected after first considering other solutions. The 2009 MUTCD allows them at uncontrolled crossings to alert drivers to crosswalks, but does not allow them at crosswalks controlled by traffic signals, STOP signs or YIELD signs. Crosswalks with in-pavement flashers are expensive to install and maintain, and should not be selected without first considering other solutions.

In-pavement flashers at crosswalks are also an option that can be considered.

A 2009 review of literature on in-pavement flashing lights may be found on the Pedestrian and Bicycle Information Center's website. Evaluations of use of in-roadway warning lights are available from Washington and Florida.

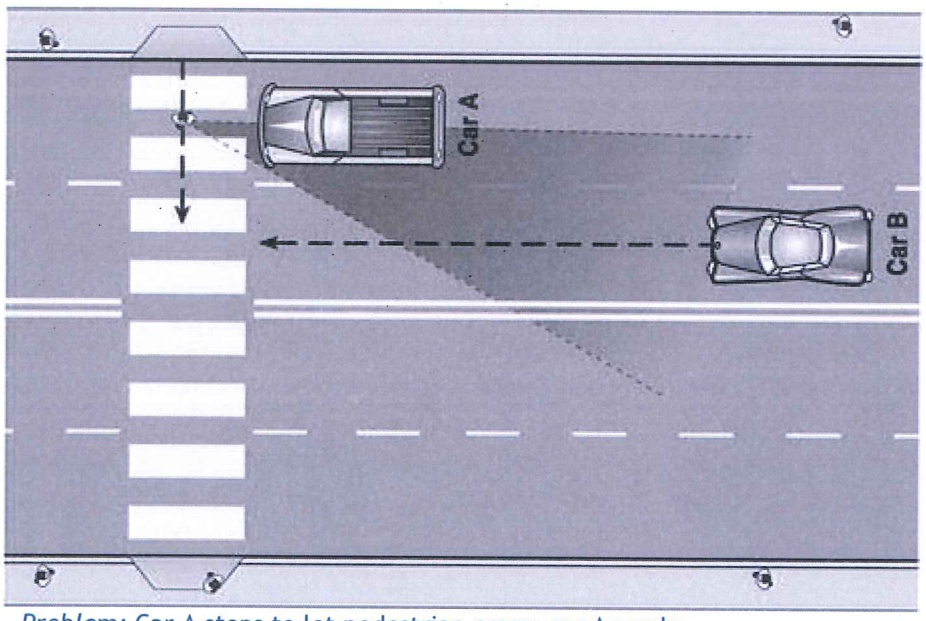
Advance Stop/Yield Line

Advance stop or yield lines encourage driers to stop further back from the crosswalk, promoting better visibility between pedestrians and motorists, and helping to prevent multiple-threat collisions at mid-block or uncontrolled crossings.

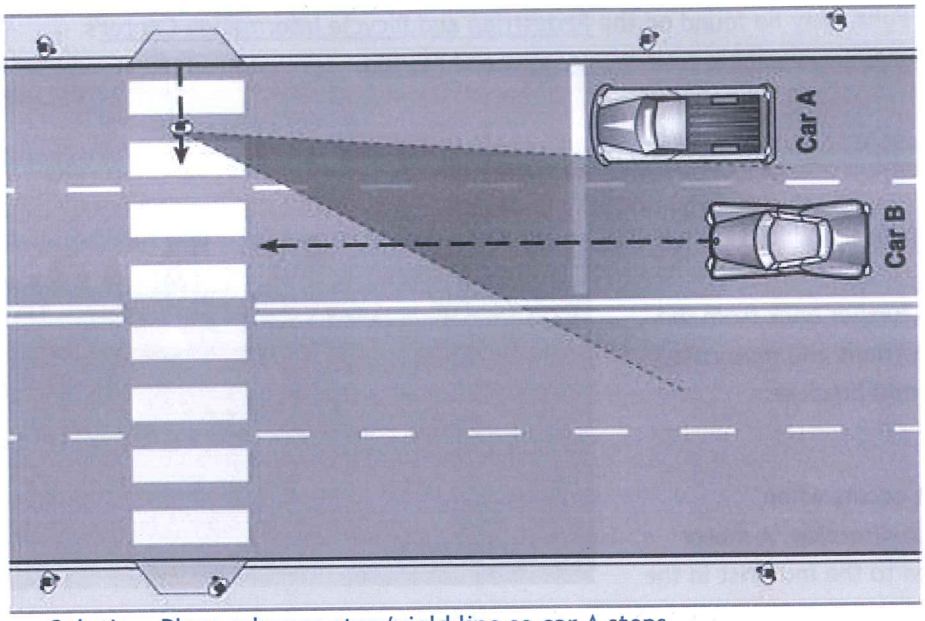
A multiple-threat collision is a pedestrian crash that occurs when pedestrians have to cross more than one lane in each direction. A motor vehicle in one lane stops and provides a visual screen to the motorist in the adjacent lane. The motorist in the adjacent lane continues to move and hits the pedestrian.

A yield line consists of multiple painted triangles (shark's teeth) .

The 2009 MUTCD recommends that yield or stop lines used at uncontrolled multi-lane crossings be placed 20 to 50 feet in advance of the crosswalk; however, according to PEDSAFE 2013, a setback of 30 feet for the advance stop or yield lines (in advance of the crosswalk) has been found to be appropriate for most situations. At signalized midblock locations, the 2009 MUTCD recommends separation of a least 40 feet between the stop line and the nearest signal indication.



Problem: Car A stops to let pedestrian cross; car A masks car B, obstructing the pedestrian's and car B's view of one another. Car B doesn't stop and may hit the pedestrian at a high rate of speed.



Solution: Place advance stop/yield line so car A stops further back; car A no longer masks car B, which can better see and be seen by the pedestrian."

The following signs are required (MUTCD 2B.11) to reinforce advance stop or yield lines.

Figure 3: Examples of STOP and YIELD here to pedestrian signs. Image provided by PBIC Designing for Safety course.

Parking Restrictions

Restricting parking in advance of crosswalks can improve visibility of the crossing for both drivers and pedestrians. At a minimum, 20 feet should be kept clear in advance of marked crosswalks to help pedestrians and drivers see each other better. Distances greater than 30 feet are generally better, but parking restrictions have to be balanced with the needs of businesses and motorists. For example, if parking is severely restricted or completely removed near schools, parents may ignore all parking restrictions.

Removing parking from corners can improve visibility between pedestrians and approaching motorists.

Treatment: Parking Restrictions at Corners

Description/Purpose
Restricting how close motor vehicles may park to a crosswalk (20 foot minimum per MUTCD) to improve pedestrian and motorist sight distance.

Expected Effectiveness
Eliminating parking spaces too close to a crosswalk will improve pedestrian and motor vehicle visibility, which can reduce the likelihood of pedestrian-vehicle conflicts and collisions.

Costs
Costs involve new street markings, signs, enforcement and public education efforts. Roadway reconstruction issues may also affect the overall cost [Zegeer et al., 2004].

Keys to Success
- Accurately identifying problem locations and appropriate improvements.
- Educating the public about the purpose of proposed improvements.
- Enforcing parking restrictions.

Key Factors to Consider
- Potentially strong resistance to the loss of parking spaces by business owners and local residents, especially in areas with limited parking.

Evaluation Measures
- Number of crossing pedestrian crashes.
- Number of pedestrian-vehicle conflicts.

This guide was developed by the Pedestrian and Bicycle Information Center (PBIC) in collaboration with SRTS experts from around the country and support from the National Highway Traffic Safety Administration (NHTSA), Federal Highway Administration (FHWA), Centers for Disease Control and Prevention (CDC) and Institute of Transportation Engineers (ITE). View full list of contributors.