



# CROSSWALKS

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## Overview

The *Manual on Uniform Traffic Control Devices* (MUTCD) defines the term Crosswalk as: (a) that part of a roadway at an intersection included within the connections of the lateral lines of the sidewalks on opposite sides of the highway measured from the curbs or in the absence of curbs, from the edges of the traversable roadway, and in the absence of a sidewalk on one side of the roadway, the part of a roadway included within the extension of the lateral lines of the sidewalk at right angles to the center line; (b) any portion of a roadway at an intersection or elsewhere distinctly indicated as a pedestrian crossing by pavement marking lines on the surface, which might be supplemented by contrasting pavement texture, style, or color.

There are five primary situations where crosswalks should be used:

- ☒ At signalized intersections with pedestrian activity, especially where pedestrian signal heads are present;
- ☒ At controlled approaches to intersections (stop and yield) with pedestrian crossings;
- ☒ At locations where a school crossing guard is normally stationed to assist children in crossing the street;
- ☒ At locations where Architectural Barriers Act (ABA) facilities are present on each side of the roadway or parking lot to building; and
- ☒ At uncontrolled crossings satisfying minimum vehicle and pedestrian volume guidelines and safety requirements.

There are two primary crosswalk types: controlled and uncontrolled. Uncontrolled crosswalks occur at locations where no traffic control (i.e., traffic signal, STOP sign, or YIELD sign) is present whereas controlled crosswalks occur at stop-controlled intersections, signalized intersections or roundabouts. Crosswalks at controlled locations (typically at intersections and pedestrian midblock signals) are favored for pedestrian crossings because vehicular traffic stops or yields to pedestrians. Consequently, there is no minimum threshold for pedestrian crossings to justify the installation of crosswalks at these locations. Uncontrolled crosswalks are less favorable and should not be implemented unless the TEA crosswalk warrants and guidelines are met. The primary focus of this bulletin is crossings at uncontrolled locations - - i.e., on an uncontrolled intersection approach or at an uncontrolled mid-block location.

There is a common misperception that crosswalks should be placed everywhere a pedestrian crosses a road. In reality, this increases the likelihood of motorists disrespecting the crosswalks potentially leading to a decrease in pedestrian safety. In general, crosswalks at uncontrolled locations should only be located with sufficient pedestrian demand, provided the roadway meets certain roadway geometric and sight requirements as discussed in the next section.

Additionally, marked crosswalks do not always make for a safer crossing. The Federal Highway Administration (FHWA) published a study entitled [Safety Effects of Marked vs Unmarked Crosswalks at Uncontrolled Locations](#). The study results revealed that a marked crosswalk alone (absent of other enhancements such as signing, certain pavement markings, flashing lights, and geometric improvement) at an uncontrolled location does not significantly lower the pedestrian crash rate as compared to an unmarked crosswalk. In fact, the crash rate has been found to significantly increase for marked crossings versus unmarked crossings on higher volume roads. Pedestrian crossing needs should routinely be identified, and appropriate solutions should be selected to improve pedestrian safety and access.

## TEA Crosswalk Warrants and Guidelines

An engineering study should be performed before crosswalks installing a crosswalk at an uncontrolled location. The following two criteria shall be satisfied in conjunction with the proposed marked crosswalk:

- ☑ The crosswalk shall provide adequate sight distance; to include vertical, horizontal, and intersection stopping sight distance.
- ☑ The crosswalk shall not cross any part of an auxiliary lane and its transition. Auxiliary lanes include left-turn, right-turn, acceleration and deceleration lanes. Two-way left-turn lanes are not considered auxiliary lanes.

Additionally, the locations being considered should have a minimum level of traffic and pedestrian volumes. All of the following four criteria should be met for installation:

- ☑ Location of midblock crossings should be a minimum of 300 feet (200 feet with an engineering study) from any controlled intersection (all-way signal/stop/yield control or pedestrian overpass).

- ☑ Pedestrian crossing volumes should meet one of the following conditions:
  - 20 pedestrians in an hour, or
  - 15 elderly, disabled and/or children in an hour, or
  - 60 pedestrians total for the highest consecutive pedestrian 4-hour period.

Pedestrian counts should only include pedestrians crossing within 100 feet on either side of the proposed crosswalk location in an attempt to capture only potential users of the proposed crosswalk.

- ☑ The two-way traffic volume should meet a minimum of 1,500 vehicles for the average daily traffic (ADT) or 150 vehicles in the pedestrian count hour.
- ☑ The current pedestrian crossing is not due to a correctable gap in the sidewalk system.

Once a crosswalk is determined to be warranted, refer to the chart on the next page (developed by TEA) that identifies criteria for recommended traffic control based on volume and roadway characteristics. The enhancements are for guidance purposes and should be applied with engineering judgment. All crosswalks must have crosswalk markings and lighting, although additional enhancements may include:

- ☑ Added visibility crosswalk markings
- ☑ Yield Here to (Stop Here For) Pedestrians sign
- ☑ Advance Pedestrian Crossing sign
- ☑ Pedestrian Actuated Signals
- ☑ Pedestrian Hybrid Beacons
- ☑ Pedestrian Overpass

Major improvements, such as pedestrian hybrid beacons and pedestrian signals, must be appropriate for conditions, and be justified by an engineering study.

See SDDCTEA Pamphlet 55-17 and the [TEA Crosswalk Warrant and Guidelines](#) for additional information.



## Traffic Control for Crosswalks at Midblock Locations and on Uncontrolled Approaches to Intersections

X = Required Treatment V = Recommended Treatment	Vehicle Volume												Vehicle Volume											
	1,500 ≤ ADT ≤ 12,000 OR 150 ≤ 1-Hour Volume ≤ 1,200												ADT > 12,000 OR 1-Hour Volume > 1,200											
	*2-Lanes Two-way			3-Lanes Two-way			≥ 4-Lanes Divided With Raised Median			≥ 4-Lanes Undivided			*2-Lanes Two-way			3-Lanes Two-way			≥ 4-Lanes Divided With Raised Median			≥ 4-Lanes Undivided		
Traffic Control Type	≤ 30 mph	35 mph	≥ 40 mph	≤ 30 mph	35 mph	≥ 40 mph	≤ 30 mph	35 mph	≥ 40 mph	≤ 30 mph	35 mph	≥ 40 mph	≤ 30 mph	35 mph	≥ 40 mph	≤ 30 mph	35 mph	≥ 40 mph	≤ 30 mph	35 mph	≥ 40 mph	≤ 30 mph	35 mph	≥ 40 mph
<b>Pavement Marking</b>																								
Crosswalk Marking: Section 3B.18	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Added Visibility Crosswalk Marking: Section 3B.18, Para 13																								
<b>Signing and Lighting</b>																								
Pedestrian Crossing (W11-2) warning sign W/ Downward Diagonal Arrow (W16-7P) Plaque: Section 2C.50	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Yield Here To (Stop Here For) Pedestrians (R1-5, R1-5a, R1-5b, or R1-5c) signs with Yield (Stop) Line marking: Section 2B.11 & 3B.16 (Yield or Stop scenario is dictated by local state law)																								
An advance Pedestrian Crossing (W11-2) warning sign with Ahead (W16-9P) plaque: Section 2C.50																								
Lighting	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<b>Midblock Drawing #</b>	1	1	2	3	3	4	3	3	4	4	4	4	2	2	2	4	4	4	4	4	4	4	4	4
<b>Uncontrolled Approach to Intersection Drawing #</b>	5	5	6	7	7	8	7	7	8	8	8	8	6	6	6	8	8	8	8	8	8	8	8	8
<b>Major Improvements</b>	Traffic Engineering Study is required to determine applicability of Hybrid Beacons, Pedestrian Signals or a Pedestrian Overpass																							
Pedestrian Actuated Signals (Section 4C.05) Drawing # 9, 12 OR Pedestrian Hybrid Beacons (Section 4F.01) Drawing # 10, 11, 13, 14 OR Pedestrian Overpass (based on ITE Design and Safety of Pedestrian Facilities Manual)																								
FHWA PUBLICATION: HRT-04-100 **	C	C	P	C	P	P	C	P	N	P	P	N	C	P	N	P	N	N	N	N	N	N	N	N
* If the crossing is at an intersection that has a dedicated left and/or right turn lane, it is considered a multi-lane section and should follow drawing 7 or 8.																								
** The letters (C,P, or N) describe the baseline minimum enhancements for midblock crosswalks according to FHWA publication number HRT-04-100. SDDCTEA's recommendations contained in this table are based on this publication's minimum criteria.																								
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.																								
If the existing speed limit is > 40 mph and pedestrian signals/hybrid beacons are not warranted, consider reducing the roadway speed limit prior to placement of crosswalk.																								
Unless otherwise stated, all section references are to the 2009 National MUTCD																								
Speed Limit = Posted Speed Limit ADT = Average Daily Traffic (total of both directions)																								

# Pedestrian and Vehicle Right of Way

The [Uniform Vehicle Code and Model Traffic Ordinances](#) (UVC), developed by the National Committee on Uniform Traffic Laws and Ordinances, is the model traffic ordinance for most states; however, each state may have its own traffic ordinances which may vary from one state to another.

Per the UVC, according to the "General" Pedestrian/Vehicle Right-of-Way established at all controlled crossings and at marked uncontrolled crossings, vehicles shall yield or stop to pedestrians in the crosswalk, but pedestrians shall not enter the path of a vehicle to constitute an immediate hazard.

# Reducing the Number of Crosswalks

The overuse of crosswalks, particularly midblock crosswalks, is a significant problem on military installations. This includes crosswalks located too close to one-another, multiple crosswalks used in low volume, low speed areas where area pedestrian signing could be used, or where gaps in sidewalk result in pedestrians needing to cross midblock.

**Eliminate Crosswalks Too Close to Controlled Crossing Locations** - Midblock crossings should be located a minimum of 300 feet (200 feet with an engineering study) from any controlled location or pedestrian overpass. When midblock crosswalks are located too close to a controlled intersection, the pedestrians should be rerouted to the controlled intersection/location and the midblock crosswalk should be removed. Ensure that the controlled location has a marked crosswalk.

**Utilize Pedestrian Area Signing** - Midblock crossings that are separated by a distance of 250 feet or less are considered to be 'within close proximity' and may be identified and signed as a pedestrian crossing area versus as individual crossings. This does not reduce the number of crossings but reduces signing. This treatment is not appropriate where the posted speed limit is greater than 30 mph and/or the vehicle volume exceeds 12,000 per day or 1,200 in the peak hour. Signing of a pedestrian crossing area is discussed later in this bulletin.

**Eliminate Sidewalk Gaps to Reduce Crossings** - Gaps in the sidewalk system often result in a midblock crossing. A gap occurs when the sidewalk on one side of the road ends, and the pedestrian must cross to the other side to use a continuous sidewalk. An example of when gaps often occur is with new development. Sidewalks are often added in front of new facilities but not in front of older facilities. When these facilities are located adjacent to each other along a roadway, gaps in the sidewalk network could be present. Gaps should be corrected by continuing the sidewalk, which in turn eliminates the reason for the midblock crossing. The following figure shows an example of a gap.

## Walking Path Realignment Example

Image Source: Google Maps



In the example above, the midblock crosswalk (A) could be eliminated by connecting the gap (blue line) and having pedestrians cross (B) at the stop-controlled intersection.



# Crosswalk Markings

Crosswalk markings provide guidance by defining and delineating paths. At uncontrolled locations where pedestrian crossings are commonly unexpected by motorists, crosswalk markings should be used in conjunction with signs and other measures. Markings shall consist of solid white lines no less than 6 inches or greater than 24 inches in width. Crosswalks may consist of transverse, diagonal, or longitudinal markings.

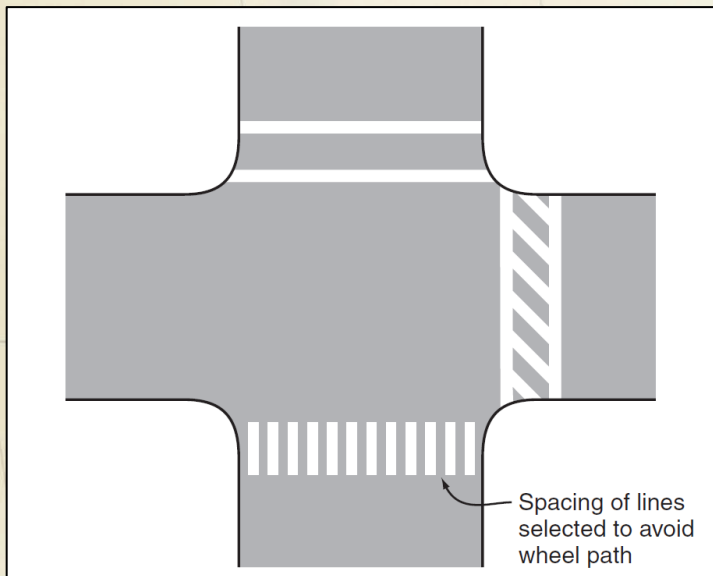
For added visibility, diagonal or longitudinal lines may be used for crosswalks where:

- ☑ Substantial numbers of pedestrians cross without any other traffic control device,
- ☑ Physical conditions of the surrounding area prompt the need for additional visibility of the crosswalk, or
- ☑ A pedestrian crossing may not be expected.

The figure below shows the different types of crosswalk markings.

## Examples of Crosswalk Markings

*Image Source: MUTCD Figure 3B-19*



Each of these three marking types is acceptable, however a consistent style should be used for crosswalks throughout the installation.

In addition to crosswalk markings, additional pavement markings, such as the stop or yield lines, will be required for multi-lane roadways.

Non-retroreflective colored pavement (including bricks, pavers, and other types of patterned surfaces) is purely aesthetic and does not provide enhanced visibility.

A marked crosswalk must be provided where accessible facilities exist, such as curb ramps and detectable warning surfaces (DWS) that direct pedestrians to cross the road at a particular location. This is independent of the pedestrian and vehicular warrants.

Maintenance ensures visibility of the markings and garners respect from motorists. Pavement markings should be reapplied periodically as needed for proper visibility. The photo below shows an example of a faded crosswalk, and the resulting lack of visibility when not maintained properly.

## Example of Faded Crosswalk



# Crosswalk Signing

Proper signing for crosswalks is critical. Crosswalks at controlled locations do not need and should not have warning signing since the traffic control for the intersection governs vehicles, and they must stop or yield at the crosswalk and intersection. Warning signage should be installed for crosswalks at uncontrolled locations. If used, the warning signing must comply with MUTCD standards. The primary sign recommended at all uncontrolled crosswalk locations is the pedestrian crossing warning sign (W11-2 MUTCD designation) warning sign with the downward-pointing arrow placard, as shown below. The size shall be 30" x 30" for single lane roadways and 36" x 36" for multilane roadways.



## Typical Pedestrian Crossing Sign (W11-2) with Downward Pointing Arrow Plaque (W16-7P)

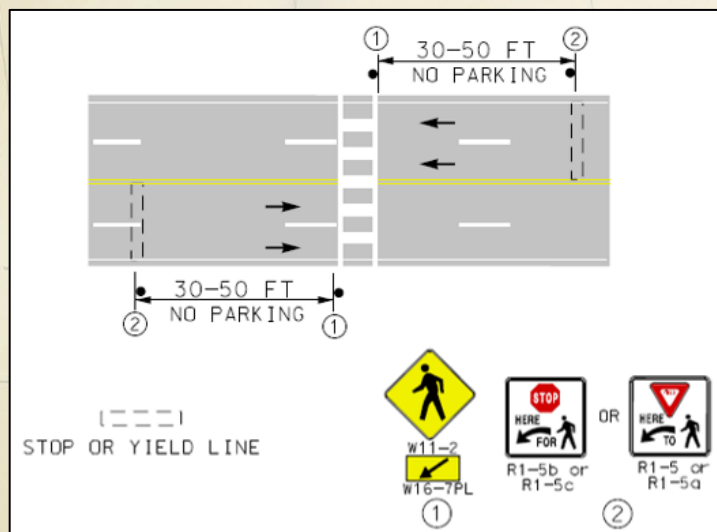
Image Source: SDDCTEA Pamphlet 55-17



This sign assembly should be located at every uncontrolled crosswalk in both directions, assuming a two-way road. Note that an option is to use the fluorescent yellow-green color. The sign assembly can be supplemented with another on the left-hand side of the road for added emphasis. If a crosswalk spans a roadway with more than two lanes, additional signage is recommended as shown below and in the table on page 3 and the associated drawings in the TEA [Crosswalk Warrant and Guidelines](#). **Note:** The drawing shown below applies to multi-lane roadways within a specific range of design speeds and ADTs. Refer to table 1 in the publication to see if another drawing is more appropriate.

### Midblock Pedestrian Crossing Signing and Striping

Image Source: TEA Crosswalk Guidelines



Midblock crossings that are separated by a distance of 250 feet or less are considered to be 'within close proximity' and may be identified and signed as a pedestrian crossing area. When using the pedestrian area signing, the individual crossings should not be signed.

To further increase visibility of a pedestrian crossing, pedestrian warning signs can be supplemented with yellow flashing beacons. When located at a crosswalk, they can be pushbutton actuated to flash only when a pedestrian is present. A rectangular rapid flashing beacon (RRFB) is also allowable in place of the traditional warning beacons. These are rectangular beacons mounted beneath a pedestrian crossing or school crossing sign, actuated by a pushbutton. An example of RRFBs is shown below.

### RRFB Example



For signing of a pedestrian crossing area, TEA recommends using the Pedestrian Crossing warning sign in conjunction with the 30" x 24" supplemental NEXT XXX FT (W16-4P) plaque. The supplemental warning plaque shall be mounted below the warning sign it supplements and on the same post. Signs should be located at the first known crossing on the right-hand side of the road, for each direction of travel.

In addition to signing where the crossing condition exists, a Pedestrian Crossing (W11-2) warning sign in conjunction with the 24" x 12" supplemental AHEAD (W16-9P) plaque may be installed to provide advance notice. These signs should be located 100 feet (minimum) in advance of the first known crossing location and on the right-hand side of the road, for each direction of travel.

For a lengthy pedestrian crossing area (> 1000 feet), it is recommended to install a second W11-2 Pedestrian Crossing sign with a supplemental NEXT XXX FT (W16-

4P) plaque at a mid-point location, for each direction of travel, to remind road users of the crossing condition. This sign assembly can also be the fluorescent yellow-green color. The following figure shows pedestrian area signing.

### Pedestrian Crossing Area Signing

Image Source: MUTCD



## Crosswalk Accessibility

The Architectural Barriers Act of 1968 (ABA) requires that buildings and facilities that are designed, constructed, or altered with Federal funds, or leased by a Federal agency, comply with Federal standards for physical accessibility. The ABA applies to Federal facilities including those on military installations. The DoD maintains standards under the ABA.

In an effort to address design elements found in public rights-of-way and not covered by the Americans with Disabilities Act (ADA) and ABA guidelines, the United States Access Board published “[Public Right-of-Way Accessibility Guidelines \(PROWAG\)](#)”, in August 2023. DoD installations are required to utilize the PROWAG for transportation elements (such as sidewalks along roadways and parking lots), in addition to Unified Facilities Criteria (UFC) 3-201-01 [Civil Engineering](#).

According to the ADA “All new construction and modifications must be accessible to individuals with disabilities. For existing facilities, barriers to services must be removed if readily achievable.” Different types of curb ramps are needed at sidewalks and crosswalk locations depending on site conditions. “Modifications” are considered to be changes to the sidewalk or ramp, or repaving of the sidewalk or street to which the crosswalk intersects.

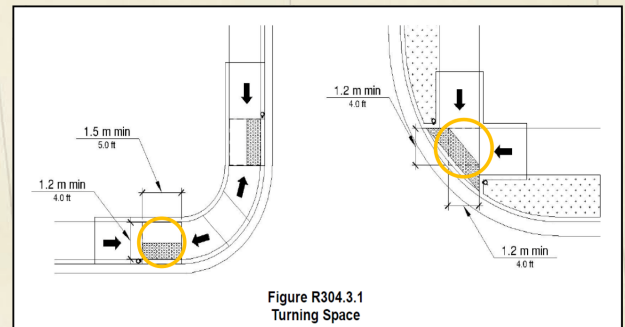
Detectable warning surfaces must be provided at the road edge in order to give visually impaired pedestrians the message that they are about to enter a roadway. There is no specific color requirement for DWS; however, whatever color is used must be in contrast with the pavement color.

The DWS must be 24 inches wide and span the width of the curb ramp.

In addition to the DWS, a turning space of at least 4-foot by 4-foot intended for wheelchair mobility is to be provided at the top or bottom of the ramp where a 90-degree turn is required. The maximum cross-slope of this ‘landing area’ should be no greater than two percent. Turning spaces are shown in the following figure.

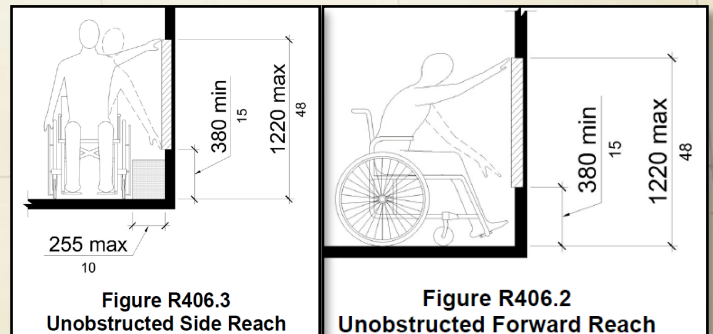
### DWS and Turning Space Locations

Image Source: U.S. Access Board



At signalized intersections where pedestrian push buttons are used, the pushbutton must be located no greater than 10 inches from the edge of the sidewalk. Sometimes, in order to achieve this, pedestrian push button stub poles are needed. The pedestrian push button should be mounted between 15 and 48 inches from the elevation of the sidewalk. See the example below.

Image Source: U.S. Access Board



## Lighting

Intersection lighting increases motorist and pedestrian visibility and reduces crash potential. Although no specific warrants have been established, the MUTCD suggests roadway lighting if nighttime pedestrian crashes are occurring. Lighting should be installed at those locations where a lighting engineer has determined that lighting will contribute to the efficiency, safety, and/or comfort of motorists and pedestrians. Similar lighting can also be



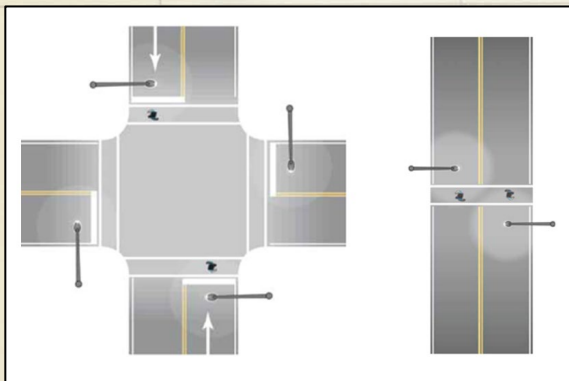
used at midblock pedestrian crosswalks and would be especially beneficial at busier crosswalks. TEA recommends that all crosswalks use proper lighting.

Most state departments of transportation, as well as the Illuminating Engineering Society of North America, have developed criteria to assist in determining lighting requirements. When designing lighting, the following factors should be considered; luminaire type, light source type, wattage, mounting height, and pole location.

As previously stated, lighting increases motorist and pedestrian visibility and reduces crash potential. In an effort to improve visibility of pedestrians, the preferred location of light standards for intersection and midblock crosswalks is illustrated on the following figure. The luminaire should be placed a minimum of 10-feet in advance of the crosswalk and be mounted 10 to 14 feet high. The purpose of locating luminaires in this manner is to light the side of the pedestrian rather than the top of the pedestrian's head.

### Preferred Crosswalk Lighting Locations

Image Source: FHWA-HRT-08-053



Light Emitting Diode (LED), induction, high output compact fluorescent, or metal halide [white or bluish-white light] lamps are recommended over the High-Pressure Sodium (HPS) lamps that produce amber light. The HPS lamps have traditionally been used for roadway lighting due to high efficiency; however, for pedestrian lighting, the white light producing lamps are recommended due to their increased reflectivity off pedestrians and increased peripheral detection by drivers. The lamp chosen should provide a vertical illuminance level, measured 5-feet from the road surface, of 30 lux at intersection crosswalks and 20 lux minimum for crosswalks at uncontrolled locations. Detailed lighting requirements for crosswalks and roadways can be found in the ANSI/IES RP-8-22 publication titled "*Recommended Practice: Lighting Roadway and Parking Facilities*".

## Additional Crosswalk Treatments

The probability of a crash between crossing pedestrians and vehicles increases as vehicular and pedestrian volumes increase. Furthermore, the severity of a crash increases as vehicular speeds increase. When warranted, traffic calming and certain forms of traffic control are effective ways to reduce the probability and severity of a pedestrian-related crash.

There are several different treatments that can be considered when vehicular-pedestrian conflicts and vehicular speeds are of concern. The table below summarizes crash reduction factors (CRF) and crash modification factors (CMF) for certain countermeasures.

Countermeasure	CRF	CMF	Basis
Crosswalk Visibility Enhancement <sup>1</sup>			
Advance STOP/YIELD signs and markings	25%	0.75	Pedestrian Crashes <sup>2</sup>
Add overhead lighting	23%	0.77	Total injury crashes
High-visibility marking <sup>3</sup>	48%	0.52	Pedestrian crashes
High-visibility marking (school zone) <sup>3</sup>	37%	0.63	Pedestrian crashes
Parking restriction on crosswalk approach	30%	0.7	Pedestrian crashes
In-street Pedestrian Crossing sign	UNK	UNK	N/A
Curb Extension	UNK	UNK	N/A
Raised crosswalk (speed tables)	45%	0.55	Pedestrian crashes
	30%	0.7	Vehicle crashes
Pedestrian refuge island	32%	0.68	Pedestrian crashes
PHB	55%	0.45	Pedestrian crashes
Road Diet - Urban area	19%	0.81	Total crashes
Road diet - Suburban area	47%	0.53	Total crashes

Source: [www.cmfclearinghouse.org](http://www.cmfclearinghouse.org)

Descriptions of certain countermeasures are described below.



**Bulbouts** - Bulbouts are extensions of the curb into a parking lane to reduce the crossing distance. A bulbout can have a traffic calming effect since the reduced lane width encourages slower operating speeds. At intersections, bulbouts reduce turning speeds since the intersection geometry is constrained and can better place pedestrians within a motorist's cone of vision as they approach the intersection. They can also help with pedestrian visibility by moving the area where they stand to wait for a gap in traffic to a location where sight distance is not limited by parked cars. Bulbouts in use are shown in the photo below.

### Bulbout Example

*Image Source: SDDCTEA Pamphlet 55-17*



**Refuge Island** - A refuge island is an island in the roadway median providing a haven for pedestrians, such that it would only be necessary to cross one direction of travel at a time. A refuge island commonly replaces an area that would otherwise be used as a two-way left-turn lane in the cross section. They can be used in conjunction with bulbouts, leaving no more than the lane width itself for pedestrians to cross. They similarly can have a traffic calming effect by reducing speeds due to the reduced roadway width. A refuge island is shown in the following photo.

### Refuge Island Example



**Raised Crosswalk** - A raised crosswalk is essentially a crosswalk installed on a speed table. A raised crosswalk is a marked pedestrian crossing elevated 3- to 6-inches above street grade at intersections or mid-block locations. Raised crosswalks can have similar effects as speed humps but also accommodate pedestrian crossings. When considering the use of raised crosswalks, they are appropriate for roadways with ADTs of up to 3,500 vehicles per day and speeds of 30 mph or less. An example of a raised crosswalk is shown on the following page.

### Raised Crosswalk Example





**Pedestrian Signals** - Pedestrian signals is an option that provides traffic control for crossings, provided certain conditions are met. Traffic Signal Warrant 4, Pedestrian Volume, presented in the MUTCD, is intended to be used where traffic volumes are so high on the major street that pedestrians endure excessive delay while trying to cross. Certain vehicular traffic and pedestrian volume requirements must be satisfied to be warranted. Traffic Signal Warrant 5, School Crossing, presented in the MUTCD, is intended for use where schoolchildren crossing the street is the primary reason to consider installing the signal. It considers the availability of adequate gaps in traffic and requires a minimum of 20 schoolchildren in the highest crossing hour as well. With this type of installation, traditional signal heads will control vehicular traffic, and pedestrian signals (WALK/DON'T) will control the pedestrians. A pedestrian signal can be used at midblock and intersection locations, with the entire intersection being signalized. A pedestrian signal example is shown below.

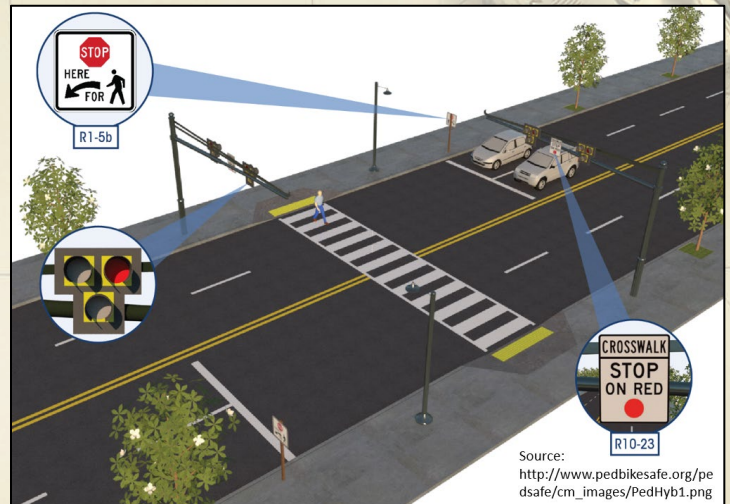
### Pedestrian Signal Example



**Hybrid Beacons** - Similar to pedestrian signals, hybrid beacons are signal systems that stop traffic to allow for pedestrians to cross, and consist of pedestrian signals with pushbuttons at the crosswalk with vehicular traffic controlled by hybrid beacons. Unlike pedestrian signals, the MUTCD does not require that a traditional signal warrant be met for installation, but the MUTCD does have guidelines on when a hybrid beacon system is appropriate. An example of a hybrid beacon is shown below, with required signal indication displays from the MUTCD following.

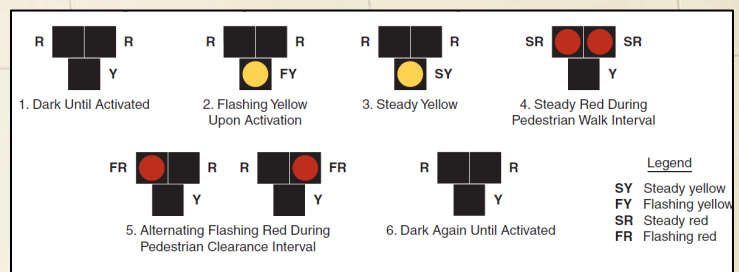
### Pedestrian Hybrid Beacon Example

Image Source:  
[http://www.pedbikesafe.org/pedsafe/cm\\_images/PedHyb1.png](http://www.pedbikesafe.org/pedsafe/cm_images/PedHyb1.png)



### Sequence for Pedestrian Hybrid Beacon

Image Source: MUTCD Figure 4F-3



**Lighted Crosswalks** - Lighted crosswalks are LEDs embedded in the pavement along the crosswalk lines perpendicular to the travel lanes. Pedestrian pushbuttons are provided to actuate the LEDs to flashing mode for a defined amount of time, which must be long enough for the pedestrian to cross. They provide an added warning to drivers that crossing activity is occurring. Since they are embedded in the pavement, they can be prone to maintenance issues by being hit and damaged over time by vehicles. The following figure shows an example of a lighted crosswalk.



## LED Lighted Crosswalk



**Pedestrian Grade Separation** - When traffic volumes and pedestrian crossings are so high that significant delays and conflicts exist when crossings occur, consider a pedestrian grade separation, specifically an overpass or underpass. Grade separation separates pedestrians from vehicles, allowing pedestrians to cross freely. A disadvantage of an overpass is that pedestrians may be reluctant to use it if it results in a long distance for pedestrians to walk.

## Pedestrian Overpass Example



# Pedestrians at Roundabouts

Roundabouts require a yield on entry for vehicular traffic. Pedestrian accommodations at roundabouts are located before the yield point, and therefore it is technically an uncontrolled location. Regardless, crosswalks can be located at roundabouts without meeting warrants for uncontrolled crossings since the fact that the roundabout is an intersection takes precedence. The pedestrian path crosses through the splitter island on an approach, which provides a refuge area for pedestrians. Therefore, they only cross one direction at a time, and only one lane at a time for a single-lane roundabout. Roundabouts are designed to improve safety for all users, including pedestrians and bicycles.

It must be noted that roundabouts present difficulties for visually impaired pedestrians who must rely on auditory cues. The difficulties stem from the confusing auditory cues resulting from the circulation of traffic within the roundabout and lack of pedestrian phases when compared to signalized intersections. Design techniques and traffic control devices used to improve safety for this population should be considered.

A crosswalk located at a roundabout should have warning signs consisting of the W11-2 Pedestrian Crossing warning sign with the Diagonal Downward Pointing arrow, as shown earlier. Crosswalk markings at roundabouts are shown on the following figure.

## Crosswalk Markings at Roundabouts

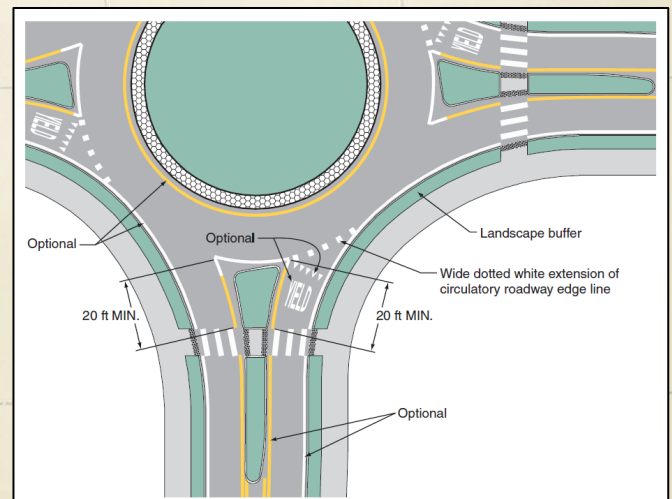


Image Source: MUTCD Figure 3C-1

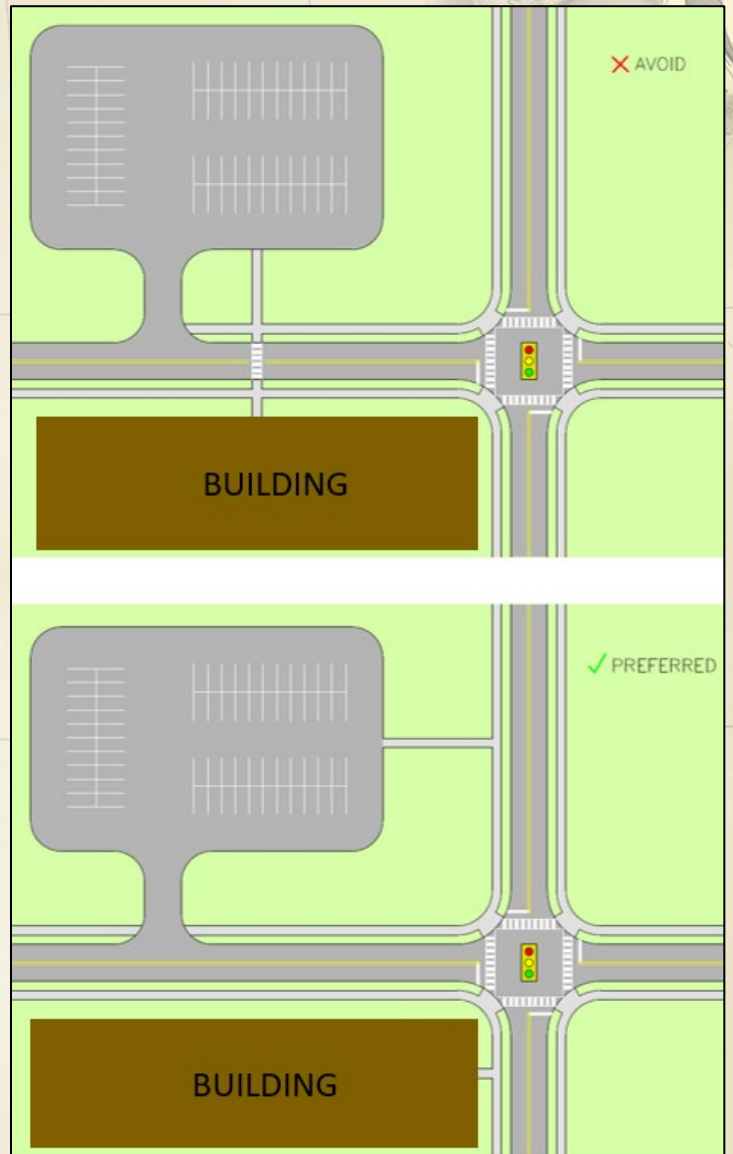
# Planning to Avoid Crossings

It is a common occurrence throughout military installations for a large facility to be constructed with its parking lot located across a street, requiring pedestrians to cross the street to access the building. If the building and parking lot are large in size, multiple crosswalks are often necessary along the same roadway. Ideally, the building and parking lot should be constructed on the same parcel, not separated by a street, thereby avoiding the need for road crossings. If the combined site requirement does not fit within the land available, consider other options such as relocating or closing the roadway that lies between the facility and parking area. Closing a roadway may require capacity improvements at other nearby roadways and intersections to accommodate the diverted traffic.

Another consideration is to avoid locating high-volume pedestrian generators such that pedestrians must walk across busy streets. This could include a barracks across the street from a gym or dining hall. Ideally, high-volume pedestrian generators should be on the same side of the busier street.

In either of these instances, if the crossing is necessary, locate the pedestrian pathway such that it crosses at a controlled location instead of a midblock location, as shown below.

Example of Sidewalk and Crosswalk Placement to Avoid Midblock Crosswalk





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## Reference List

- ✓ [TEA Home](#)
- ✓ [Better Military Traffic Engineering, SDDCTEA Pamphlet 55-17. 2016.](#)
- ✓ [Addendum to SDDCTEA Pamphlet 55-17, Crosswalk Warrant and Guidelines, 1 July 2021.](#)
- ✓ [Federal Highway Administration: Manual on Uniform Traffic Control Devices, December 2023 Edition](#)
- ✓ [DOD Supplement to the MUTCD, TEA, 2015](#)
- ✓ [ANSI/IESNA RP-8-22 Recommended Practice: Lighting Roadway and Parking Facilities, 2022 – Purchase is required.](#)

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