

# ENHANCED CROSSING TREATMENTS



Crossings, whether midblock or at an intersection, should provide safe and comfortable locations for people to cross the street. A crossing location should offer adequate gaps between vehicles and encourage motorist yielding or stopping to allow pedestrians to cross.

To justify the installation of a pedestrian hybrid beacon or traffic signal, the **MUTCD 2009** has warrants based primarily on pedestrian volumes and vehicle volumes. These warrants are used to help allocate limited financial resources. In some cases, pedestrians may not be crossing the street in sufficient numbers to satisfy the warrant because there are not adequate gaps in traffic or they do not feel comfortable doing so. This is the common “chicken or the egg” problem: a certain volume of pedestrians is required to meet the warrant to install a beacon or signal, yet pedestrians need enhanced crossing treatments to feel comfortable crossing the street. The unintended consequence of this scenario is that street environments have frequently been built in a manner that discourages walking.

Designers may use a variety of treatments to create convenient and comfortable crossings for pedestrians. These include median crossing islands, signs, Rectangular Rapid Flash Beacons, pedestrian hybrid beacons, and traffic signals. Existing guidance encourages the use of engineering judgment to develop a justification for the installation of a marked crosswalk, pedestrian hybrid beacon, a traffic signal, or other crossing treatments.

## KEY DESIGN FLEXIBILITY

The **MUTCD** includes flexibility for the designer to consider factors besides traffic volume during an engineering study to justify the installation of a beacon or traffic signal. It also suggests that even if a traffic signal warrant is met, other treatments (at the designer’s discretion) may be more appropriate to create a safe crossing:

*“An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is justified at a particular location.”*

**MUTCD 2009, Sec. 4C.01**

*“Consideration should be given to providing alternatives to traffic control signals even if one or more of the signal warrants has been satisfied.”*

**MUTCD 2009, Sec. 4B.04**

## OTHER RESOURCES

*“Where signalized or stop-controlled pedestrian crossings are not warranted but demand exists or is anticipated, designers should continue to work toward goals of safety and comfort for people walking through other means, such as actuated crossings or enhanced crossing treatments.”*

**NACTO Urban Street Design Guide 2013, p. 110**

*“If traffic and roadway characteristics make crossing difficult for the path user, the need for a signal or active warning device (such as a beacon) should be considered based on traffic volumes, speed, number of lanes, and availability of a refuge.”*

**AASHTO Bike Guide 2012, p. 5-38**

*“When the spacing of intersection crossings is far apart or when the pedestrian destination is directly across the street, pedestrians will cross where necessary to get to their destination conveniently, exposing themselves to traffic where drivers might not expect them. Midblock crossings, therefore, respond to pedestrian behavior. Properly designed and visible midblock crosswalks, signals and warning signs warn drivers of potential pedestrians, protect crossing pedestrians and encourage walking in high-activity areas.”*

**ITE Designing Walkable Urban Thoroughfares 2010, p. 136**

# APPLYING DESIGN FLEXIBILITY

## LAND USE CONSIDERATIONS

It is important for designers to consider the existing, anticipated, and desired use of the potential crossing location both midblock and at intersections. Major factors include land uses on either side of the street and walking distances without and with the crosswalks. For example, if a senior center is located on one side of an intersection and a library on the other and the nearest crossing is greater than 300 feet in walking distance, an enhanced marked crossing should be considered.

1 If a community center is located near the center of a long block and a bus stop exists on the opposite side of the street, this location should be considered for a midblock crossing. 2

The **AASHTO Pedestrian Guide** emphasizes the importance of midblock crossings in areas where intersections are spaced relatively far apart and there are pedestrian generators on both sides of the street: “Midblock crossings are preferred because pedestrians should not be expected to make excessive or inconvenient diversions in their travel path to cross at an intersection” (2004, p. 89). In all locations, enhanced pedestrian crossing treatments should be considered based on the number of vehicle travel lanes, and speed and volume of vehicular traffic.

## WHEN TO MARK A CROSSWALK

Careful consideration should be given to when to mark a crosswalk and when enhanced crossing treatments are needed. The **MUTCD** states that “crosswalk lines should not be used indiscriminately” (2009, Sec. 3B.18). Before a crosswalk is installed at a midblock location, an engineering study should be completed and include several factors such as the number of lanes, distance to adjacent signalized intersections, pedestrian and vehicle volumes, and vehicle speeds.

At crossing locations with relatively high traffic volumes and speeds and longer crossing distances, designers should consider enhanced crossing treatments (e.g., crossing island, signal, or signing) to supplement a marked crosswalk. **FHWA Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations** recommends substantial crossing improvements be installed to supplement a marked crosswalk under any of the following conditions:

- where the speed limit exceeds 40 mi/h.
- on a roadway with four or more lanes without a raised median or crossing island that has (or will soon have) an ADT of 12,000 or greater.

- on a roadway with four or more lanes with a raised median or crossing island that has (or soon will have) an ADT of 15,000 or greater. (2005, p. 52)

It is a misinterpretation of this study to conclude it is undesirable to mark a crosswalk in locations that meet those conditions. The proper conclusion of the study is to supplement the marked crossing with enhanced crossing treatments to provide a convenient and safe crossing.

## TRAFFIC SIGNAL OR BEACON WARRANT STUDY

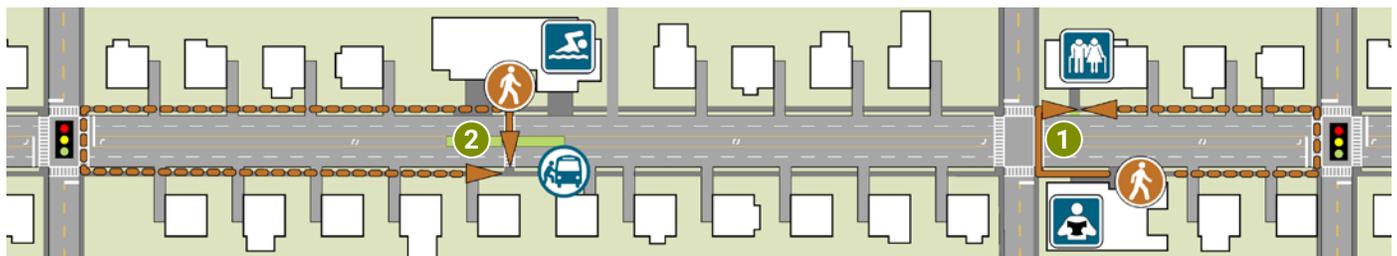
There is a great deal of flexibility in applying warrants to determine if a traffic signal or beacon is needed at a pedestrian crossing. Before a traffic signal or beacon is installed, an engineering study must be completed to determine if the installation of a traffic control signal will improve the overall safety and/or operation of the intersection (**MUTCD 2009, Sec. 4C.01**). **NACTO Urban Street Design Guide** recommends that designers “take into account both existing as well as projected crossing demand” (2013, p. 110). Designers have the flexibility to estimate demand if the absence of a signal limits crossing opportunities of potential users, especially the young, elderly, or persons with disabilities (**MUTCD 2009, Sec. 4C.01**). Additionally, where “it is not possible to obtain a traffic count that would represent future traffic conditions, hourly volumes should be estimated” (**MUTCD 2009, Sec. 4C.01**).

Three of the eight warrants outlined in the **MUTCD** are used as justification for the installation of a signal for pedestrians. These are: Warrant 4 (Pedestrian Crossing), Warrant 5 (School Crossing), and Warrant 7 (Crash Experience). The criterion for Warrant 4 (Pedestrian Crossing) can be reduced by 50 percent if the “15th-percentile crossing speed of pedestrians is less than 3.5 feet per second” (2009, Sec. 4C.05).

An additional warrant for a pedestrian hybrid beacon 3 is provided in **Chapter 4F** of the **MUTCD 2009**. A pedestrian hybrid beacon can be used at locations where warrants for a signal are not satisfied or locations where warrants are satisfied but a decision is made not to install a signal.

## ADDITIONAL CROSSING TREATMENTS

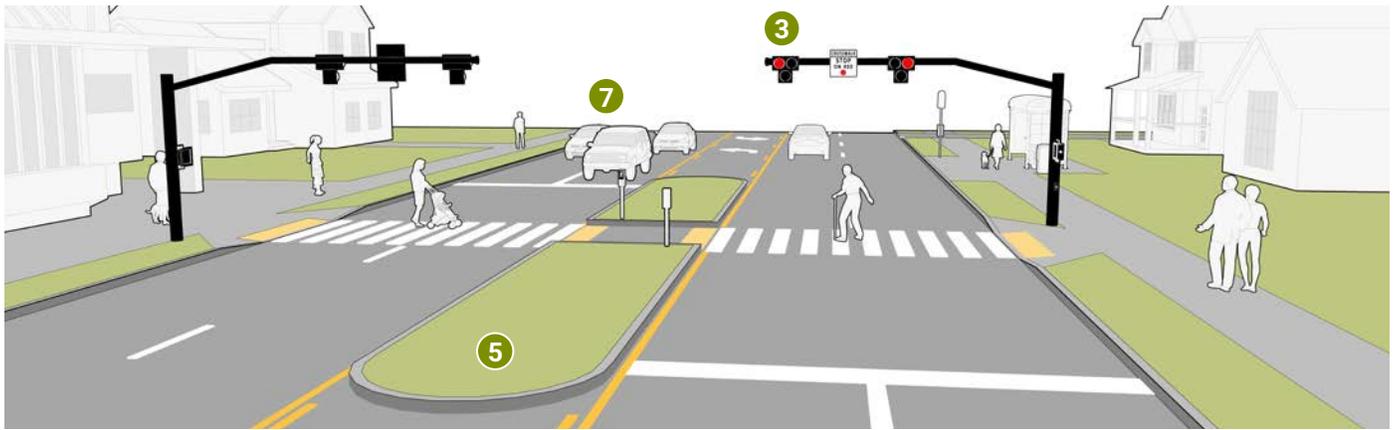
In addition to marking crosswalks and installing traffic signals or beacons, designers have the flexibility to use a variety of treatments such as rectangular Rapid Flash Beacons, pedestrian crossing islands, and advance yield/stop lines and signing.



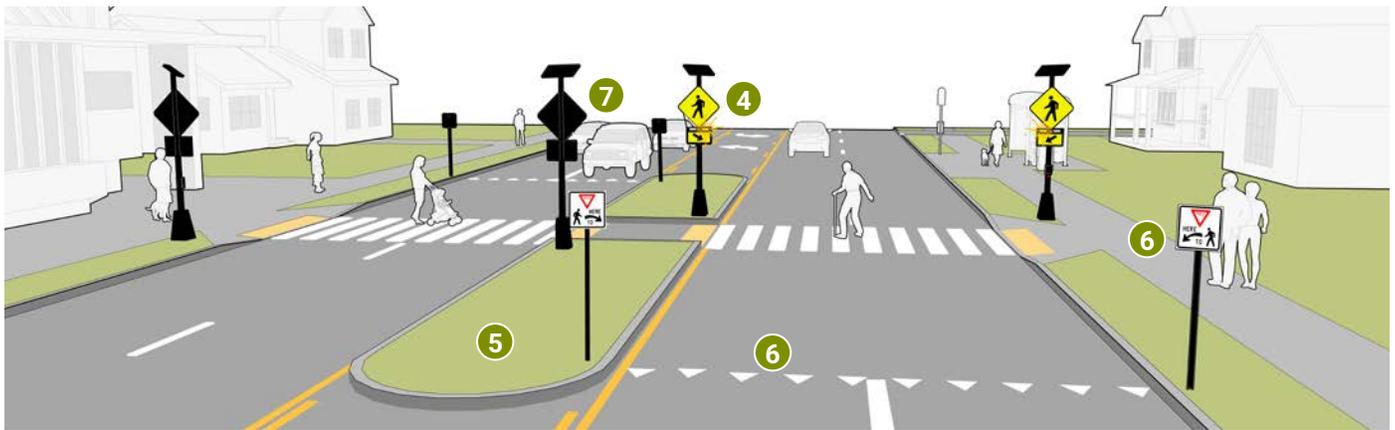
LAND USE CONTEXT EXAMPLE

— Walking distance with crosswalk

- - - Walking distance without crosswalk



**PEDESTRIAN HYBRID BEACON AND CROSSING ISLAND**



**RECTANGULAR RAPID FLASHING BEACON AND CROSSING ISLAND**

### RECTANGULAR RAPID FLASHING BEACONS

At uncontrolled crossings where a signal or pedestrian hybrid beacon is not warranted, cost prohibitive, or deemed unnecessary designers should consider supplementing pedestrian, bicycle/pedestrian, or school crossing warning signs with Rectangular Rapid Flashing Beacons (RRFBs).

4 Generally, this treatment should be used with caution at crossings with more than two lanes without a refuge. **FWHA Effects of Yellow Rectangular Rapid-Flashing Beacons on Yielding at Multilane Uncontrolled Crosswalks** found an 88-percent average compliance rate for motorists yielding to pedestrians at crossings with RRFBs; this rate was sustained after 2 years (2010, p. 9).

### PEDESTRIAN CROSSING ISLANDS

Raised medians or pedestrian crossing islands are a Proven Safety Countermeasure and have demonstrated a 46-percent reduction in pedestrian crashes. Pedestrian refuge areas or islands 5 allow pedestrians to cross the street in two stages and significantly reduce the distance a pedestrian must cross at one time. The **AASHTO Pedestrian Guide** states that a crossing island should be considered “where the crossing exceeds 60 ft” (2004, p. 90). **FWHA Safety Effects of Marked**

### Versus Unmarked Crosswalks at Uncontrolled Locations

found that providing raised medians on multilane roads “can significantly reduce the pedestrian crash rate and also facilitate street crossing” (2005, p. 55). However, on roadways with a raised median and volumes exceeding 15,000 ADT, a marked crosswalk is appropriate only with additional crossing treatments. Crossing islands should be a minimum of 6 feet wide (ITE **Designing Walkable Urban Thoroughfares 2010, p. 141**). At locations where bicycles may be crossing, such as where a shared use path crosses a roadway, “10 ft is preferred in order to accommodate a bicycle with a trailer” (AASHTO **Bike Guide 2012, p. 5-48**).

### ADVANCE YIELD/STOP LINES AND SIGNING

Advance yield/stop lines and signing 6 can be installed at locations where there are concerns about multiple threat crashes. 7 They indicate to drivers the appropriate location to yield or stop so that they do not “place pedestrians at risk by blocking other drivers’ views of pedestrians and by blocking pedestrians’ views of vehicles approaching in the other lanes” (MUTCD 2009, Sec. 3B.16). Additionally, parking should be prohibited in between the yield or stop line and the crosswalk to increase visibility.

## CASE STUDIES

### I STREET AT MAKEMIE PLACE, SW WASHINGTON, DC

A Safe Routes to School action plan for Amidon-Bowen Elementary School evaluated the intersection of Makemie Place and I Street SW for a potential crosswalk. Prior to the study, schoolchildren had to cross I Street SW at one of two signalized intersections approximately 600 feet apart to access the main school entrance. The City installed a marked crosswalk halfway between these intersections at the T-intersection of Makemie Place SW along with warning signs, a crossing island, and curb extensions to increase driver awareness of the crossing, reduce vehicle speeds, and increase the pedestrian queuing area. This crossing also connected bus stops on both sides of I Street SW. Crosswalk signs were installed as part of an experiment and are non-compliant.



### IMPROVEMENT PLAN FOR UNCONTROLLED MARKED CROSSWALKS SEATTLE, WA

In 2001, the City of Seattle completed a detailed inventory analysis of 622 marked crosswalks at uncontrolled locations. Crosswalks were rated based on traffic volume, number of lanes, and speed. In 2002, the City released a multi-year Improvement Plan for Uncontrolled Marked Crosswalks that addressed identified deficiencies. Rather than just decide “yes” or “no” on whether to mark a crosswalk, the improvement plan asks “what are the most effective measures that can be used to help pedestrians safely cross the street?” The plan was implemented over a period of six years. Deficiencies were addressed with signing, markings, crossing islands, road and lane diets, rectangular rapid flash beacons, pedestrian signals, and other ADA improvements.



### SE BUSH STREET AND 122ND AVENUE PEDESTRIAN HYBRID BEACON PORTLAND, OR

As part of the SE Bush neighborhood greenway project, the Portland Bureau of Transportation installed a pedestrian hybrid beacon at the SE Bush Street crossing of 122nd Avenue in July 2012. Counts at this location did not meet the pedestrian hybrid beacon warrant prior to installation. However, engineers designed the intersection to accommodate 50–100 bicycle and pedestrian crossings during the peak hour based on previous experience where bicycle and pedestrian volumes increased following installation of other neighborhood greenways in the City. December 2013 counts indicated that pedestrian hybrid beacon warrants are satisfied at this location.



Source: Scott Batson, City of Portland Bureau of Transportation