



NORTH CAROLINA
Department of Transportation

Multimodal Guidance: Pedestrian Crossing Facilities

Transportation Mobility and Safety Division

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Connecting people, products and places safely and efficiently with customer focus, accountability and environmental sensitivity to enhance the economy and vitality of North Carolina

Purpose and Content

- This general guidance provides additional information and resources for designers.
- This is not intended to be used as a planning document, or to replace engineering judgement, or as a substitute for other guidance (i.e. Complete Streets methodology, Roadway Design Manual).
- This guidance is an educational resource developed primarily for NCDOT, consultants and local government staff for pavement marking and signing improvements.

Multimodal Guidance Resources

General Guidance	Standards	TEPPL Topics
<ul style="list-style-type: none">• Basic overview of facility type and traffic control design elements.• Links to additional resources.	<ul style="list-style-type: none">• Standard drawings for pavement markings and signage.• Will be updated as new guidance is released.	<ul style="list-style-type: none">• More detailed information about implementation.• Policy and statutory references.



NORTH CAROLINA
Department of Transportation

Guidance for Multimodal Safety Improvements and Traffic Control Devices



Pedestrian



Bicycle



Transit

Background

This guidance is a reference for local governments and NCDOT Divisions developing plans to implement projects managed by NCDOT or on NCDOT system roads, where the project includes facilities for pedestrians, bicyclists, and bus transit. Consult the Manual on Uniform Traffic Control Devices (MUTCD) for official guidance for traffic control devices. Review the NCDOT Approved Product List for more information about materials that will be considered by NCDOT projects.

This document is not intended for planning-level decisions; designers should consult with the NCDOT Integrated Mobility Division (IMD) to review Complete Streets guidance and assist with initial project planning or scoping decisions. This is not a design standard; designers should consult the Roadway Design Manual and other design resources for additional information about design requirements. Maintenance, operations and network accessibility are additional considerations not included in this document but are important for project decisions.

When To Use This Guide

This guidance provides high level information about multimodal networks (linear features), intersection treatments, and traffic control devices for bicyclists, pedestrians and public transportation buses traveling in the right-of-way. **This guidance directs staff and consultants to relevant Standard Drawings and to other NCDOT resources to inform pavement marking and signing design plans for multimodal facilities.**

This guidance applies *after* projects have been identified in a local or regional transportation plan(s). Network decisions made in plans are based on need, public input, future conditions, and consideration for all modes of travel. Projects led by NCDOT or on NCDOT system roads should be developed consistent with the NCDOT Complete Streets Policy and Complete Streets Project Development Evaluation Methodology.

This guidance is not a substitute for engineering judgment. Each project should be reviewed based on local context and conditions, prior to developing project design. Complete an engineering study as appropriate (see MUTCD for guidance). Consider completing a feasibility review or assessment, such as traffic analysis, for complex configurations.

Consult additional guidance for specific facility design standards and criteria, including but not limited to the following:

- [NCDOT Roadway Design Manual](#) (and referenced design guidelines)
- [NCDOT Signal Design Section Design Manual](#)
- [NCDOT Roadway Standard Drawings](#)
- [FHWA MUTCD](#) (11th edition, published December 2023)

How To Use This Guide

1. Select facilities or features identified in plans for each mode of travel being considered for the roadway or intersection project.
2. Review description of facility type.
3. Review “When to Use” and “When Not to Use” as guidance for facility and feature selection.
4. Consider other feature types that supplement the treatment.
5. Review Frequently Asked Questions (FAQs) for additional information and potential scenarios to be considered.
6. Review other resources listed in “For More Information” for additional design materials.



Pedestrian



Bicycle



Transit



Pedestrian

Signalized Intersections



Crosswalks



Pedestrian
Countdown Signal



Leading Pedestrian
Interval

Unsignalized Crossings



Crosswalks



Advance Yield



In Street Signs



Refuge Island



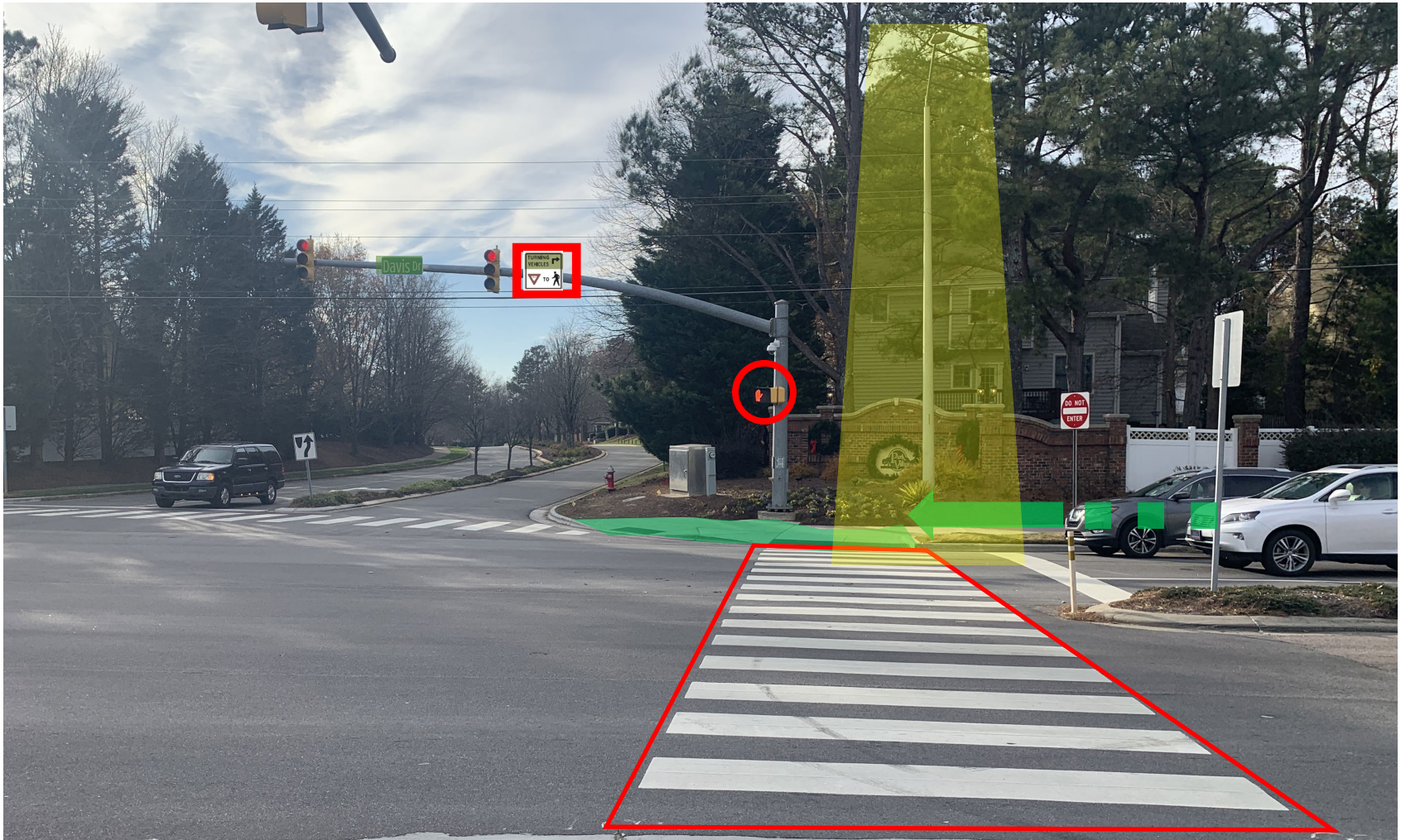
Rectangular
Rapid Flashing
Beacon



Pedestrian
Hybrid Beacon

Pedestrian Crossing Features

- Focus of this guidance is on standard pavement markings, signs and traffic control devices associated with pedestrian crossings.
- Additional features, such as curb ramps, sidewalk, and lighting should also be considered as part of the overall pedestrian network.



Public Right-of-Way Accessibility Guidelines (PROWAG)

- U.S. Access Board released this final rule on August 8, 2023.
- “These minimum guidelines will become enforceable once they are adopted, with or without modifications, as mandatory standards under the ADA by the U.S. Department of Justice (DOJ) and the U.S. Department of Transportation (USDOT), or the four federal agencies that set standards for the federal government under the Architectural Barriers Act – the U.S. Postal Service (USPS), General Services Administration (GSA), U.S. Department of Defense (DOD), and U.S. Department of Housing and Urban Development (HUD).” ([U.S. Access Board](#))
- NCDOT continues to follow current ADA standards until PROWAG is adopted.



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Pedestrian Crossings

Pedestrian networks are facilities specifically designed and designated for people traveling on foot or using personal mobility devices. Sidewalks and pathways are the most common examples of pedestrian networks. Bicycles may be prohibited from operating on sidewalks, based on local ordinance. Pedestrian crossing treatments are typically selected based on proximity of destinations, vehicle traffic volumes, traffic speed, roadway configuration, existing traffic controls, and expected pedestrian activity. Special consideration must be made for pedestrians who use wheelchairs, have low to no vision, have cognitive or developmental differences, or travel slowly due to age or other reasons. Crossing locations near schools are a specialized type of crossing that may require additional considerations. School-related pedestrian crossings are reviewed following other standards and guidance.

Primary sources for planning and selecting bikeways include the following:

- [NCDOT Pedestrian Crossing Guidance](#)
- [AASHTO Guide for the Planning, Design and Operation of Pedestrian Facilities](#)
- [FHWA MUTCD](#)

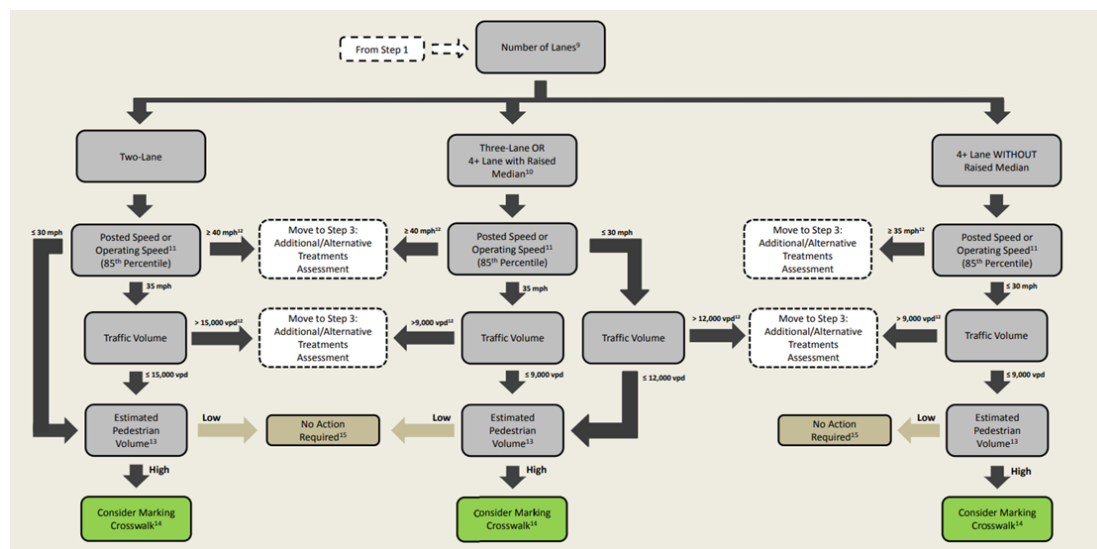


Figure: Flowchart Element for Unsignalized or Midblock Crossing Assessment (NCDOT Pedestrian Crossing Guidance)



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Crosswalks (Signalized)

Crosswalks are established at intersections by the convergence of sidewalks or pedestrian access routes. Marking a crosswalk increases awareness and visibility of the crossing for both drivers and pedestrians. Consider maintenance, pedestrian exposure and visibility of the crossings when selecting crosswalk marking patterns. Crosswalks should be designed at least as wide as the approaching sidewalks or paths.



When To Use

- Use high visibility crosswalks to mark crossings at intersections where pedestrian activity is high, with a notable crash history, or where the overall context of the corridor includes high visibility markings.
- Accessible curb ramps are always used in conjunction with marked crosswalks.

When Not To Use

- Consider variations of, or alternatives to, high visibility crosswalks at high traffic intersections, where markings may fade more quickly than the expected lifecycle.



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FAQs: Crosswalks (Signalized)

What alternative countermeasures or supplemental features can be considered?

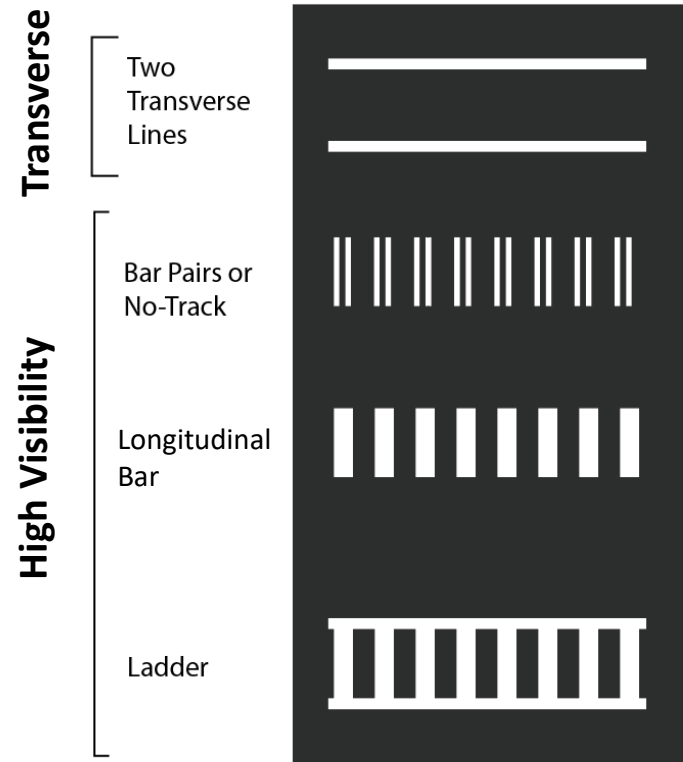
Depending on the characteristics of the intersection, high-visibility crosswalk enhancements can be considered to improve the crosswalk conspicuity. Many other features can be applied at crosswalks, including curb extensions, beacons, signing, etc.

What safety issues are most critical to consider?

Crosswalks should be designed as straight alignments across the intersection. The crosswalk should be placed in the most visible location.

What other design issues or trade-offs should be considered?

The MUTCD requires that crosswalks be a minimum width of 6 feet; except at midblock crosswalks on roads with posted speeds of 40 mph or greater, where the minimum width shall be 8 feet. Decorative crosswalks should not degrade the contrast of the white crosswalk lines and should not detract driver attention from traffic control devices or pedestrians. They should not be implemented in place of high-visibility crosswalks.



For More Information:

- [MUTCD Section 3C.03](#)
- [FHWA STEP Program](#)
- [NCDOT TEPL Topic # C-54](#)
- [Pavement Marking Detail: High Visibility Crosswalks – No Track Marking Guidance](#)



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Pedestrian Countdown Signal

Pedestrian countdown signals consist of a standard pedestrian signal head (which shows either a WALKING PERSON or UPRAISED HAND indication) and a display showing a countdown of the remaining crossing time in seconds. Typically, the countdown starts at the beginning of the pedestrian change interval (indicated by the flashing UPRAISED HAND indication).



When To Use

- Consider using at any location with sidewalk and curb ramps on the approach to the intersection.

When Not To Use

- May require additional improvements, such as sidewalk or curb ramps, to support the crossing and the addition of pedestrian countdown signal head.
- Consider alternatives for crossings on slip lanes or channelized lanes, such as separate WALK phase or Yield To signage.
- Consider alternatives at dual turn lane configurations.



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FAQs: Pedestrian Countdown Signal

What alternative countermeasures or supplemental features can be considered?

In urban centers with high levels of pedestrian activity, Pedestrian Recall (automatic WALK phase each cycle) may be considered to provide more consistent pedestrian indications.

What safety issues are most critical to consider?

Left turns are typically higher speed movements at signalized intersections. Where in conflict with the WALK phase, protected phasing should be considered.

What other design issues or trade-offs should be considered?

Placement of accessibility features such as push-buttons relative to the crossing should be considered in the design of the signal and for the WALK phase.



For More Information:

- [MUTCD Section 4D.02; 4I.01-4](#)
- [NCDOT Signal Design Manual](#)
(Push Button Placement)



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Leading Pedestrian Interval (LPI)

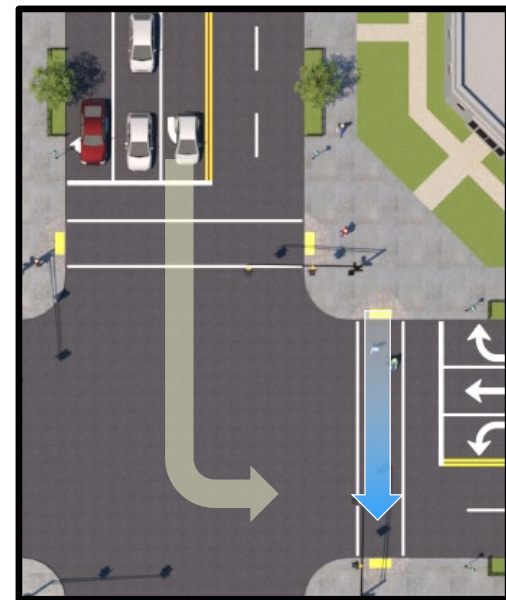
A Leading Pedestrian Interval (LPI) gives pedestrians a typical 3- to 7-second head start entering the crosswalk before vehicles in the parallel direction are given the green signal indication. This allows pedestrians to establish their presence in the crosswalk, improving their visibility to turning drivers.

When To Use

- At all signalized intersections in urban areas where sidewalk, marked crosswalk, and pedestrian signal heads are present.
- To reduce turning movement conflicts where WALK phase is concurrent with permitted turning movements.

When Not To Use

- At interchange off-ramps or other high-speed, high-volume approaches to intersections.
- At intersections with exclusive pedestrian WALK phases.





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FAQs: Leading Pedestrian Interval

What alternative countermeasures or supplemental features can be considered?

When pedestrian activity is high, exclusive pedestrian (“Barnes Dance”) phases may be considered as a substitute to LPI. Review for including Accessible Pedestrian Signal (APS) with LPI for pedestrians with low to no vision.

What safety issues are most critical to consider?

Intersections with heavy left turns in developed areas or in locations where vulnerable pedestrians, such as young students or older adults, are priority locations for implementing LPI.

What other design issues or trade-offs should be considered?

LPI may not provide notable safety benefit to pedestrians crossing side street approaches with low turning volumes, especially if using Rest in Walk.



For More Information:

- [NCDOT Signal Design Manual](#)
- [MUTCD Section 4I.06](#)
- [FHWA STEP Program](#)



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Crosswalks (Unsignalized)

Uncontrolled crosswalks occur where sidewalks intersect a roadway at a location with no traffic control (e.g., traffic signal or STOP sign). Unsignalized crossings may occur at midblock locations or trail crossings.



When To Use

- High visibility markings should always be used for unsignalized crosswalks.
- Use at crossing locations with higher pedestrian volume and a posted speed less than or equal to 35 mph.

When Not To Use

- Avoid using at locations where no pedestrians are expected to cross or within a short distance of other marked crosswalks.
- Avoid using without other traffic controls or crossing enhancements on roads with more than 12,000 vehicles per day or a posted speed limit of 40 mph or greater.



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FAQs: Crosswalks (Unsignalized)

What alternative countermeasures or supplemental features can be considered?

Consider adding supplemental warning signs and/or markings, geometric improvements (refuge island, curb extensions, traffic calming, etc.), or adding a beacon.

What safety issues are most critical to consider?

Marked crosswalks alone may not be sufficient for uncontrolled pedestrian crossing locations along roads with high traffic volumes, high speeds and long distances to controlled crossings.

What other design issues or trade-offs should be considered?

Road user compliance with marked crosswalks depends on traffic volume, speed and distance to other crossings.



For More Information:

- [MUTCD Section 3C.02](#)
- [NCDOT Pedestrian Crossing Guidance](#)
- [FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations](#)
- [Standard Practice for Crosswalks- Mid-Block \(Unsignalized\) Signing \(TEPPL C-36\)](#)



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Advance Yield

The Yield Here To Pedestrians (R1-5) sign and its variations instruct drivers on where to yield in advance of marked crosswalks at multi-lane, uncontrolled locations. This sign is accompanied by yield line pavement markings that indicate advance yield (“shark’s teeth”).



Figure: R1-5 sign

When To Use

- Use at multilane, uncontrolled locations with marked crosswalks.
- Consider for lower speed roads (35 mph or less) with limited visibility due to vehicles parked in adjacent parking lanes or where buses stop.

When Not To Use

- Avoid using in advance of crosswalks on an approach to or departure from a controlled intersection or roundabout.
- Consider alternatives or different placement if the R1-5 sign would block the drivers’ view of other signing at the crosswalk (e.g., W11-2 sign).



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FAQs: Advance Yield

What alternative countermeasures or supplemental features can be considered?

Yield line markings (commonly referred to as “shark’s teeth”) can be used to indicate where drivers should yield in advance of the crosswalk. Pedestrian crossing signs (W11-2) may be used at the crosswalk or in advance in conjunction with the R1-5 sign. Yield markings and signs may be used with refuge islands and/or Rectangular Rapid Flashing Beacons (RRFBs).

What safety issues are most critical to consider?

Advance yield signs and markings are important to consider at multilane crossing locations where a vehicle stopped too close to the crosswalk can block the view of the pedestrian to motorists in the adjacent lane (and vice versa).

What other design issues or trade-offs should be considered?

The sign and yield markings should be placed 20 to 50 feet in advance of the crosswalk, and parking should be prohibited between the sign and the crosswalk. Yield line markings are always accompanied by an R1 series sign.



For More Information:

- [MUTCD Section 2B.19](#) (Yield Here To Signs)
- [MUTCD Section 3B.19](#) (Yield Lines)
- [NCDOT Pedestrian Crossing Guidance](#)



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In-Street Signs

The In-Street Pedestrian Crossing sign (R1-6) is used to remind road users the pedestrians have the right-of-way at unsignalized or uncontrolled crosswalks. It is placed on the center line, a lane line, edge line or on a median island at the crosswalk location.



When To Use

- Use on 2- or 3-lane roads with speed limits 35 mph or less.
- Prioritize for high-volume crossing locations, to avoid overuse.

When Not To Use

- Do not use at signalized locations, crossings controlled by a pedestrian hybrid beacon, or at STOP or YIELD controlled intersection approaches.
- Do not use at unmarked crossing locations.



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FAQs: In Street Signs

What alternative countermeasures or supplemental features can be considered?

The In-Street sign shall be used as a supplement to the pedestrian crossing warning signs (W11-2). Overhead Pedestrian Crossing signs (R1-9) can substitute for the In-Street sign at the crosswalk location.

What safety issues are most critical to consider?

North Carolina is a “Yield State” by law, so the YIELD version of the sign must be used (as opposed to the STOP version used in some other states).

What other design issues or trade-offs should be considered?

The sign shall not be post-mounted or placed on either side of the roadway. The sign should also not be placed in advance of the crosswalk. The sign should be mounted on non-metal breakaway supports.



Figure: R1-6 sign

For More Information:

- [MUTCD Section 2B.20](#)
- [NCDOT Standard Practice S-75](#)



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Refuge Island

A pedestrian refuge island is a median at a pedestrian crossing location to allow pedestrians to find an adequate gap in one direction of traffic at a time.

When To Use

- At intersections or midblock crossing locations on roads with four or more lanes, especially where speed limits are 35 mph or greater or volumes are 9,000 vpd or greater.
- At crossing locations on 2- or 3-lane roads that have high vehicle speeds or volumes.



When Not To Use

- Avoid using at locations where left turns onto side streets are high.



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FAQs: Refuge Island

What alternative countermeasures or supplemental features can be considered?

Crosswalk visibility enhancements (markings, signs, lighting, etc.) are often used with refuge island. An offset, changing the direction of the pedestrian's travel in the island, can be used to orient crossing pedestrians to face oncoming traffic. Curb extensions can be used to further shorten the crossing distance.

What safety issues are most critical to consider?

Refuge islands decrease the stress and complexity for crossing pedestrians by allowing them to focus on crossing one direction of traffic at a time.

What other design issues or trade-offs should be considered?

Refuge islands should be designed to allow the anticipated number of pedestrians or bicyclists to stand and wait for a gap in traffic.



For More Information:

- [MUTCD Section 3C.12](#)
- [Roadway Standard Drawing Notes for Median Island \(848.06, sheet 13-13\)](#)



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Rectangular Rapid Flashing Beacon (RRFB)

Rectangular Rapid Flashing Beacons (RRFBs) are conspicuity enhancements that increase visibility of pedestrians in the crosswalk. The beacons are actuated by pedestrians emitting a flashing pattern toward traffic on both approaches to the crossing. RRFBs may be installed at unsignalized intersections, at roundabout crosswalks, and across free-flow turn lanes separated by a channelized island.

When To Use

- At uncontrolled crossing locations where vehicle speeds are equal to or less than 35 mph.
- At midblock crosswalks where visibility of the crosswalk may be obscured or driver yielding is poor.

When Not To Use

- Do not use at signalized intersections, approaches controlled by a STOP sign or pedestrian hybrid beacon, or uncontrolled intersections with heavy turning movements.
- Avoid using RRFBs at crossings on roadways with speed limits of 40 mph or greater.



Figure: RRFB. Source: FHWA



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FAQs: Rectangular Rapid Flashing Beacon

What alternative countermeasures or supplemental features can be considered?

Consider implementing Pedestrian Hybrid Beacon (PHB) or pedestrian signal at crossings with higher traffic speeds or where crossing 4 or more lanes without a median or refuge island.

What safety issues are most critical to consider?

Higher operating speeds (over 35 mph) may impact driver yielding compliance at the crosswalk.

What other design issues or trade-offs should be considered?

Pedestrians and drivers may benefit from education about how RRFBs operate. Visibility of the warning sign and flashing beacon assembly on the approach is an important design consideration for RRFB installation. Consider advance warning signing or advance RRFBs to increase visibility of the crossing.



For More Information:

- [NCDOT Pedestrian Crossing Guidance](#)
- [MUTCD Section 4L](#)
- [FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations](#)
- [NCDOT Signal Resource – RRFB Sign Detail](#)



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Pedestrian Hybrid Beacon (PHB)

A Pedestrian Hybrid Beacon (PHB) consists of two red lenses above a single yellow lens. Unlike a traffic signal, the PHB rests in dark until a pedestrian activates it via pushbutton or other form of detection. When activated, the beacon displays a sequence of flashing and solid lights that indicate the pedestrian walk interval and when it is safe for drivers to proceed.

When To Use

- Consider at locations with higher speeds and vehicle volumes, but where traffic signal warrants are not met.
- Review for roads with 3 or more lanes and where traffic volumes exceed 9,000 vpd or the speed limit is 35 mph or higher.

When Not To Use

- Do not use at a location with another beacon or signal type.
- Consider alternatives at intersections, due to limited visibility of the beacon heads by side street traffic.



1

Blank for drivers



2

Flashing yellow



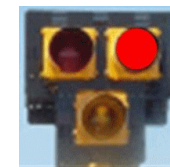
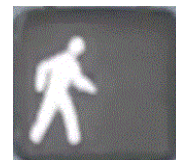
3

Steady yellow



4

Steady red



5

Wig-Wag



Return to 1



Figure: PHB sequence. Source: FHWA



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FAQs: Pedestrian Hybrid Beacons

What alternative countermeasures or supplemental features can be considered?

High visibility crosswalk marking, refuge islands, and advance STOP markings are commonly used in combination with PHBs. Signalized crossings, meeting warrants, may also be considered as an alternative to PHBs. W11-2 warning signs with an AHEAD plaque may be placed in advance of the PHB.

What safety issues are most critical to consider?

PHBs can be a very effective countermeasure at high-speed, multilane crossing locations. Pedestrian crossing volume, vehicle speed and traffic volume, local familiarity with the device are important considerations.

What other design issues or trade-offs should be considered?

If PHBs are not in common use in the community, educational outreach should be conducted in conjunction with implementation of the PHB. Optional signage such as the “Crosswalk-STOP on Red” (R10-23) or “STOP on Steady Red-Yield on Flashing Red after STOP” (R10-23a) may be installed to further communicate driver and pedestrian expectations at the crossing. The steady yellow interval is determined based on engineering practice.



For More Information:

- [NCDOT Pedestrian Crossing Guidance](#)
- [MUTCD Section 4J, 4F.17](#)
- [FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations](#)

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