NCDOT Pedestrian Crossing Treatment Evaluation Guidance

This flowchart lays out a process to evaluate the need for treatments to assist pedestrians at potential crossing locations and aims to establish consistency in the use of pedestrian treatments. It is not intended to be used to prioritize sidewalk improvements or to evaluate the connectivity of a pedestrian network. It is intended to be applied at the approach level for each leg of an intersection or for mid-block locations. The flowchart may also be applied to shared-use path, trail, or other crossing locations where bicyclists and other non-motorized users may share the same facility as pedestrians; however, the research supporting this flowchart is based on pedestrian-only usage. Several general principles and considerations for the use of this flowchart are given below:

- While thresholds for factors are provided, engineering judgment is always encouraged when considering the appropriateness of a desired crossing location as well as what traffic control device(s), if any, may be suitable to assist pedestrians in crossing, particularly for sites near threshold values or sites with special circumstances or populations.
- Field visits are recommended to confirm site characteristics and input data.
- Decisions that lead to the consideration of or need for a treatment should only be implemented if financial resources are available to install and maintain the treatment. Local participation is encouraged to support the installation of treatments identified as appropriate.
- The flowchart and assessment process gives considerations and recommendations for treatment installation, rather than requirements (other than in a few instances where requirements are put forth by national policy.)[4]
- Crossing locations within school zones or along school walking routes are beyond the scope of this assessment and should be reviewed using different factor thresholds where applicable.

For further background, resources, or references that support the Flowchart, please consult the North Carolina Pedestrian Crossing Guidance report at www.ncdot.gov

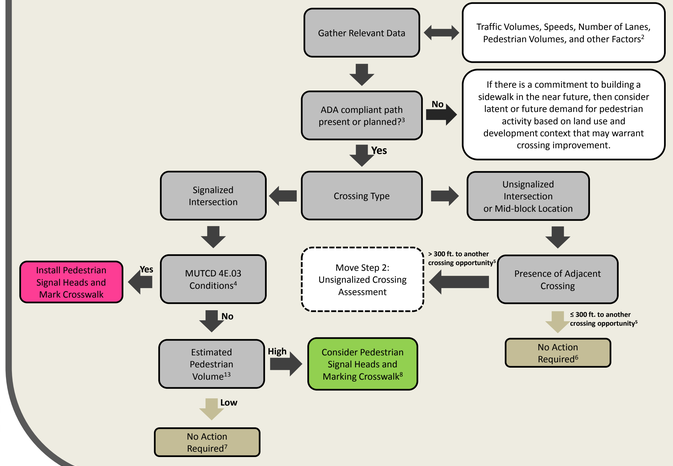
When to Use this Flowchart?

The use of this flowchart may be prompted through a variety of mechanisms, including:

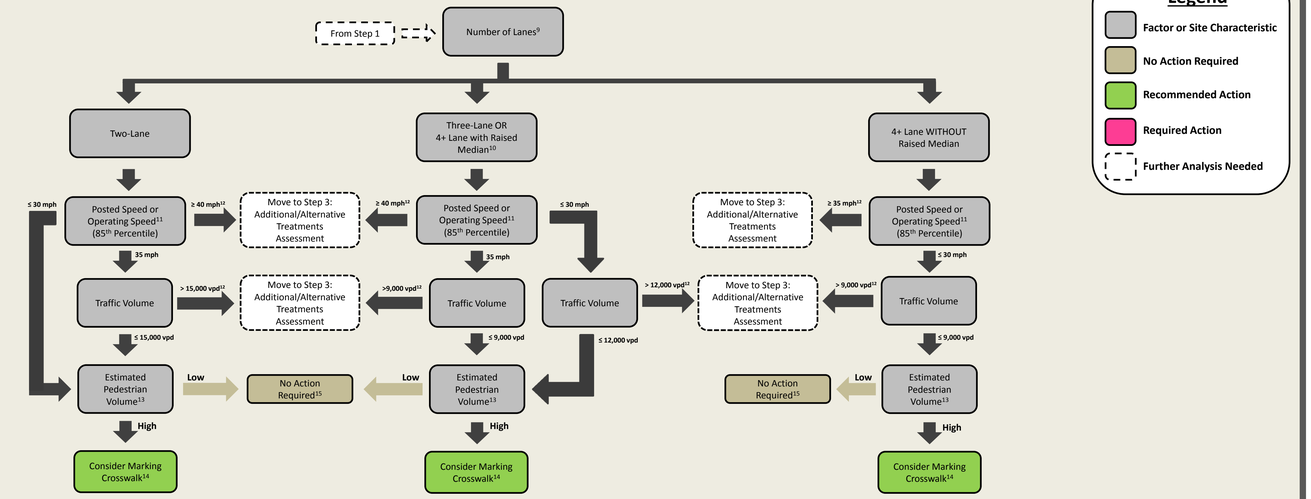
- **Citizen requests or municipal requests**
- **Development of a pedestrian or greenway plan**
- **Identification of a pedestrian crash hot spot location**
- **Systematic review of existing crossing locations**
- **As a component within an established operations and maintenance assessment process**

An ADA request[1] follows a different process.

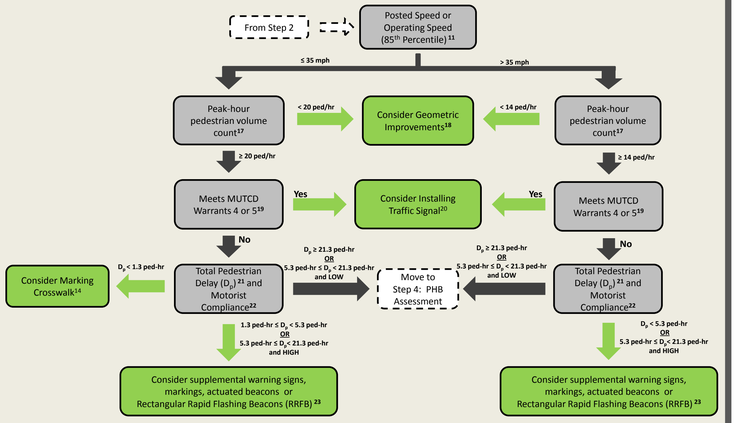
Step 1: Document Existing Characteristics / Signalized Crossing Assessment



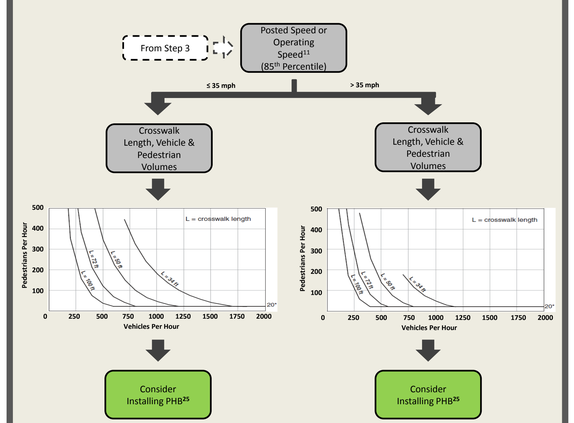
Step 2: Unsignalized Crossing or Midblock Crossing Assessment



Step 3: Additional/Alternative Treatments Assessment[16]



Step 4: Pedestrian Hybrid Beacon (PHB) Assessment[24]



Legend

- Factor or Site Characteristic
- No Action Required
- Recommended Action
- Required Action
- Further Analysis Needed

(1) The ADA only applies to locations with existing pedestrian facilities. Crosswalks constitute distinct elements of the right-of-way intended to facilitate pedestrian traffic. Resurfacing of a crosswalk requires the provision of **curb ramps** at that crosswalk. (*DOJ-DOT Joint Technical Assistance on Title II ADA requirements*, 7/8/2013).

(2) In the process of installing or improving a pedestrian crossing, **additional factors or site characteristics** should be considered, which enhance an understanding of the local context of the pedestrian facility in question. Other factors to consider include:

- Sight distance restrictions,
- Driver yielding rates,
- Pedestrian compliance,
- Crash history,
- Heavy truck traffic,
- Lighting considerations,
- Proximity to or location of transit stops,
- Special pedestrian populations (children and/or elderly),
- Future (5-10 yr. out) traffic or pedestrian volumes, and
- Future (5-10 yr. out) land use changes , growth or development patterns.

(3) If no sidewalk is present, but there is evidence of pedestrian activity, consider initiating a separate process outside the scope of this flow chart to develop a project to construct the sidewalk. Curb ramps with landings and crossing treatments may be included in TIP projects where entity expresses firm commitment and has funds to install sidewalk in the near future. (NCDOT Alternate Curb Ramp Designs memo 10/20/2011)

(4) Pedestrian signal heads MUST be installed in conjunction with traffic signals if: MUTCD Warrant 4 or 5 is met, an exclusive signal phase is provided for pedestrian movements, the site is an established school crossing, or where multi-phase signal indications may confuse or cause conflicts with pedestrians guided only by traffic signal indications. (see *MUTCD 4E.03*) Engineering judgment should always be applied in decisions to install pedestrian signal heads. Check signal timing to ensure adequate times for pedestrian movements, and consider additional treatments , if appropriate, to shorten crossing distances.

(5) Mid-block crosswalks should not be located ≤ 300 ft. of an unsignalized intersection or ≤ 400 ft. of a signalized intersection. (NCDOT *Standard Practice for Crosswalks – Mid-Block (Unsignalized) Signing*, 2/12/2008). For distances greater than these thresholds, an engineering study should be performed to evaluate whether the intersection operations would interfere with the provision of a crosswalk.

(6) Nearby crossing location should allow sufficient crossing opportunity. Use engineering judgment for unique circumstances where closely spaced crosswalks may be needed due to pedestrian activity.

(7) If a crash problem is evident or a high percentage of special pedestrian populations are present, consider other geometric or supplemental treatments to enhance pedestrian safety. See Common Resources List (Appendix A) for other options.

(8) Consider installing a pedestrian signal to provide consistency with adjacent intersections (e.g. in downtown area). If a crash problem is evident or a high percentage of special pedestrian populations are present, consider additional treatments to supplement a pedestrian signal, if deemed appropriate from an engineering study, to enhance pedestrian safety. See common resources list for other options.

(9) Number of lanes required for full crossing. This does not consider if lanes are wide, or if the street includes on-street parking, bike lanes or other features that may increase the overall crossing distance. Two-way center turn lanes are not considered medians and should be counted when determining the number of lanes.

(10) Raised medians or crossing islands must be at least 6 ft wide and 5 ft long to function as a refuge area for pedestrians. Multi-lane (4+ lane) undivided roads, or roads with painted medians, are considered the same as **no raised median**. (FHWA Report HRT-04-100, Sept 2005)

(11) For most sites, the speed limit can be used as an approximation of operating conditions. Where there is concern that the 85th percentile **operating speeds** may be near or exceed speed thresholds given, a speed study should be conducted to determine the 85th percentile speed. If both data are available, use whichever speed is higher.

(12) Marking a crosswalk alone may be insufficient and may cause an increase in pedestrian crash risk. Further engineering analysis is needed. (FHWA Report HRT-04-100, Sept 2005)

(13) Consider whether **pedestrian volume,** obtained through observational data or estimated by proxy measures based on land use context, is sufficient to prioritize location for marking crosswalk. Use judgment to choose appropriate "low" volume threshold. Considerations include:

- Is not near high pedestrian trip generators
- Does not connect complementary land uses
- Has less than 25 pedestrians per pedestrian peak hour or less than 100 pedestrians/day.
- For mid-block locations only: has less than 25 pedestrians per hour for at least four hours (see *NCDOT Standard Practices for Crosswalks – Mid-Block (Unsignalized) Signing and Pavement Markings*, Feb 2008)
- Lower volume thresholds may be considered for crossings with a significant presence of a special population such as children or the elderly

14) Use engineering judgment based on location context to determine if the crosswalk should be marked and what type of pattern is most appropriate. Mid-block crosswalks should be marked using a high-visibility type of pattern. High-visibility markings may be appropriate for school crosswalks or where pedestrians may not be expected by drivers. **All decisions are subject to availability of funding to install and maintain treatments.**

(15) Gap availability should allow for sufficient crossing opportunities.

(16) Additional/Alternative Treatments Assessment thresholds are per *NCHRP Report 562, Appendix A* (2006). See the report for using observed peak-hour pedestrian volumes, calculating total pedestrian delay, and other details.

(17) Observed pedestrian volume count thresholds include pedestrians crossing the roadway during the pedestrian peak-hour. At an intersection, this includes all pedestrian crossings from both directions and both approaches of the roadway.

(18) Further engineering study is needed to determine what, if any, modifications to the intersection or crossing geometry should be implemented. Geometric improvements may include the installation of median refuge islands, curb extensions, or traffic calming devices, or other modifications at a crossing location to minimize the crossing distance, make the crossing as perpendicular to the conflict traffic as feasible, enhance visibility of and by the pedestrian by removing obstacles to both pedestrian and driver lines of sight, etc. See Common Resources List (Appendix A) for other options.

(19) Paraphrased from the **2009 MUTCD 4C.05.02 Warrant 4, Pedestrian Volume**: The need for a traffic signal shall be considered if:

A. For each of any 4 hrs of an avg. day, there are at least 107 ped/hr crossing it (see Fig. 4C-5); or
B. For 1 hr (any 4 consecutive 15-min periods) of an avg. day, there are at least 133 ped/hr crossing it (see Fig. 4C-7).

Note: If posted, statutory, or 85th percentile speed > 35 mph OR site is in built-up area of isolated community with population < 10,000, use minimum thresholds of 75 ped/hr for A and 93 ped/hr. for B. (see MUTCD 4C.05.03)

- 4C.05.04: Warrant shall not be applied where site is < 300 ft. to nearest traffic signal or STOP sign controlling the street that pedestrians want to cross unless the proposed signal will not restrict progressive movement of traffic.
- 4D.01.06: Midblock crosswalks shall not be signalized if they are < 300 ft. from the nearest traffic signal, unless the proposed traffic control signal will not restrict the progressive movement of traffic.
- Where MUTCD Warrant 4 or 5 is met and it is deemed appropriate to install a signal, pedestrian signal heads MUST be included (see Note 4).

(20) If the warrant is met, there is still no requirement to install a traffic signal. Other treatments like the pedestrian hybrid beacon may be able to be used instead of a signal to mitigate impacts on vehicular delay. An engineering study should be conducted prior to installation of either treatment.

(21) Total Pedestrian Delay uses average pedestrian delay as calculated using Equation 18-21 of the *2000 Highway Capacity Manual* and multiplies that by the peak-hour pedestrian volume to determine total pedestrian delay for the approach. (See Note 16 regarding peak-hour pedestrian volume.)

(22) Motorist compliance is considered "HIGH", if within the general vicinity of the location under study, driver culture is such that motorists tend to yield to a pedestrian attempting to cross at an uncontrolled location. If motorists rarely stop for a crossing pedestrian in the vicinity of the location under study, then compliance is considered "LOW." (*NCHRP Report 562, Appendix A,* 2006)

(23) Further engineering study is needed to determine what, if any, enhanced or active traffic control devices should be implemented. These improvements may include warning signs, markings, or beacons that are present or active at the crossing location at all times or those devices that display a warning only when pedestrians are present or pressing the street (such as an RRFB or other actuated device). See Common Resources List (Appendix A) for other options.

(24) Pedestrian Hybrid Beacon Assessment is per 4F.01.06 and 4F.01.07 of the MUTCD.

(25) If plotted point falls above applicable curve for crosswalk length, consider installing a **Pedestrian Hybrid Beacon (PHB)**. This assumes that **traffic signal** does not meet MUTCD Warrant 4 or 5, or that it was rejected after being considered through an engineering study. If plotted point falls below applicable curve for crosswalk length, consider supplemental warning signs, markings, actuated beacons or RRFBs.

July 17, 2015