



Montana Department of Transportation

PO Box 201001
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VISION ZERO

zero deaths
zero serious injuries

Memorandum

To: e-distribution
see listing below

From: Gabe Priebe, P.E. *GBP*
Traffic & Safety Engineer

Date: November 1, 2019

Subject: Guidance for Determining Pedestrian Crossing Treatment at Uncontrolled Locations

The process to determine eligibility for pedestrian crossing treatment is based on site location, pedestrian crossing demand, pedestrian types (school age, elderly, etc.), vehicle speeds and other site conditions such as continuity with adjacent pedestrian facilities. Once treatment eligibility is established, a process for selecting the type of treatment is based on vehicle speed, average daily traffic, and width of the roadway. The type of treatment may range from marked crosswalks and signage to pedestrian-actuated beacons or pedestrian signals.

Refer to the attached memo entitled Uncontrolled Pedestrian Crossing Treatment Process and Matrix for guidance and procedure for determination of pedestrian treatment. This memo is based on support from National Cooperative Highway Research Program (NCHRP) Report 562 (1), FHWA research, and input from Traffic & Safety staff.

A site-specific memo providing justification for treatment eligibility along with the recommended treatment should be provided to the Traffic Operations Engineer for review and approval prior to installing any pedestrian treatment.

w/ Attachment: Uncontrolled Pedestrian Treatment Selection Process & Matrix- 8/29/2019

Engineering Bureau Chiefs
District Administrators
District Preconstruction Engineers
District Traffic Engineers
District Maintenance Chiefs
District Maintenance Superintendents
Dustin Rouse, Preconstruction Engineer
Dwane Kailey, Engineering Administrator
Doug Bailey, Traffic Investigations
Stan Brelin, Traffic Operations

TECHNICAL MEMORANDUM

Montana Department of Transportation - Safety Engineering Section

Uncontrolled Pedestrian Crossing Treatment Selection Process and Matrix

Date: August 29, 2019

Project #:
23024.001

To: Patricia Burke, PE and Tasha King, PE

From: Nick Foster, AICP, RSP and Julia Knudsen

INTRODUCTION

Pedestrian crossings are generally defined by whether they are controlled (e.g., signal, pedestrian hybrid beacon) or uncontrolled and by whether the crossing is located at an intersection or mid-block. The purpose of this memorandum is to provide recommended guidance for where to provide an uncontrolled crossing and what type of treatment may be appropriate.

UNCONTROLLED PEDESTRIAN CROSSING TREATMENT SELECTION PROCESS AND MATRIX

Figure 1 illustrates a process for determine whether to provide a pedestrian crossing at a given uncontrolled location. For locations where the process shown in Figure 1 determines that a pedestrian crossing should be provided, Figure 2 provides a matrix that can be used to determine what the appropriate treatment may be. This matrix is also provided on a larger scale as Attachment "A."

The flowchart in Figure 1 and the matrix in Figure 2 are based on National Cooperative Highway Research Program (NCHRP) Report 562 (1), FHWA's *Safety Effects of Marked vs. Unmarked Crosswalks* report (2), and a review of other State practices (3). A spreadsheet implementing the results of NCHRP Report 562 is available online and can be used to conduct a more detailed analysis of what crossing treatment may be appropriate. *The flowchart and matrix are presented as guidelines to be a starting point for deciding where to provide a crossing and what type of treatment may be appropriate.* Certain site characteristics may warrant deviation from these guidelines (e.g., crossings may be more closely spaced to better align with crossing generators; there may not be enough pedestrian crossings today to meet the volume criteria due to the current crossing condition, but it is expected there would be enough demand once the crossing is installed). An engineering study of the proposed location should be conducted prior to making a final decision on the crossing location and treatment.

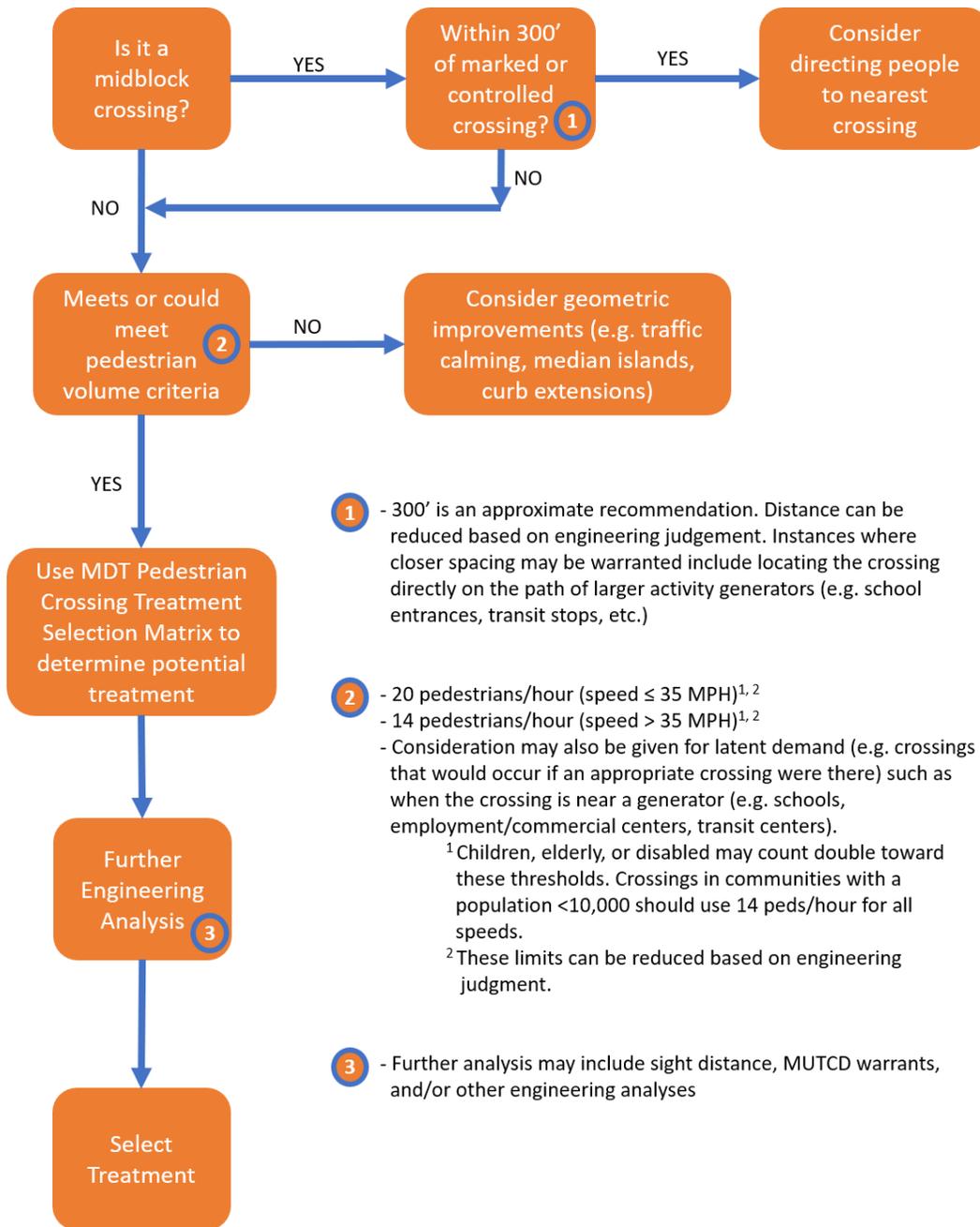


Figure 1 Selecting an Uncontrolled Pedestrian Crossing Treatment

MDT PEDESTRIAN CROSSING TREATMENT SELECTION MATRIX

2 Lane Facility					
Speed MPH	0 - 8,000 ADT	8,000 - 11,000 ADT	11,000 - 14,000 ADT	14,000 - 17,000 ADT	>17,000 ADT
0 - 30	C	C	C	E	A
35	C	C	E	E	A
40+	E	E	A	A	A

3 Lane Facility					
Speed MPH	0 - 8,000 ADT	8,000 - 11,000 ADT	11,000 - 14,000 ADT	14,000 - 17,000 ADT	>17,000 ADT
0 - 30	C	[C], E	[C], E	[C], A	[E], A
35	C	[C], E	[C], E	[E], A	[E], A
40+	E	[E], A	[E], A	[E], A	A

4 Lane Facility					
Speed MPH	0 - 8,000 ADT	8,000 - 11,000 ADT	11,000 - 14,000 ADT	14,000 - 17,000 ADT	>17,000 ADT
0 - 30	C	E	A	A	A
35	E	E	A	A	A
40+	E	A	A	A	A

5 Lane Facility					
Speed MPH	0 - 8,000 ADT	8,000 - 11,000 ADT	11,000 - 14,000 ADT	14,000 - 17,000 ADT	>17,000 ADT
0 - 30	[C], E	[C], A	[E], A	A	A
35	[C], E	[C], A	[E], A	A	A
40+	[E], A	[E], A	A	A	A

*Treatment recommendations based on NCHRP Report 562, FHWA's *Safety Effects of Marked vs. Unmarked Crosswalks*, the MUTCD, and input from MDT Staff.

LEGEND	
An engineering study should be completed prior to selecting and installing any crossing treatments.	
C	Consider marked crosswalk with appropriate signage.
E	Consider marked crosswalk with enhancements, such as traffic calming, refuge islands, curb extensions, advanced yield markings, raised crosswalks, flashing beacons, or other high-visibility treatments.
A	Consider pedestrian-actuated beacons (i.e., rectangular rapid flashing beacons or pedestrian hybrid beacons) or pedestrian signal. MUTCD warrants for pedestrian hybrid beacons and pedestrian signals should be evaluated.
[X]	treatment option in brackets indicates treatment is applicable with installation of raised median

NOTES	
1	Use observed speed data if possible; otherwise use the posted speed limit of the street being crossed to determine the appropriate row to use
2	Higher degrees of treatments may be warranted if pedestrian crossing volumes are greater than 25 people per hour or if there is a significant amount of users with special needs (e.g. elderly, school-age children)
3	Refer to the MUTCD and MDT Road Design Manual for additional information on selecting & designing the appropriate treatment

Figure 2 Pedestrian Crossing Treatment Selection Matrix

EXAMPLE APPLICATION

An analyst is evaluating whether to install a marked crossing across Highway A halfway between Bobcat Street and Grizzly Avenue. There is a popular city park on the south side of Highway A and a community center with afterschool programs on the north side of the highway. To determine whether this location may be appropriate for a crossing treatment, the analyst gathers the following data:

- **Distance to nearest marked or controlled crossing:** It is about 700 feet to the nearest marked crossing on Highway A.
- **Posted speed:** 35 MPH
- **Existing crossings:** 15 crossings during peak hour (10 children and 5 adults)
- **City population:** 8,500

The analyst reviews the flowchart in Figure 1 and determines that this location meets the distance and crossing volume¹ criteria.

Then, the analyst reviews the matrix shown in Figure 2 to determine what treatment may be most appropriate. To do this, the analyst gathers the following data:

- **Number of lanes:** 3 lanes (one through lane in each direction, plus a center turn lane)
- **ADT:** 9,500 vehicles/day

Based on this data, the matrix in Figure 2 recommends that either: 1) a marked crosswalk with a median refuge island; or 2) an enhanced marked crosswalk without a median refuge island be installed. The analyst completes an engineering study, examining sight distance, driveway locations, and MUTCD requirements for signage of the different options under consideration. Ultimately, the analyst recommends that a marked crosswalk with a median refuge island be installed. The analyst also recommends curb extensions, given that children are expected to make up a large proportion of the crossing demand and on-street parked vehicles limit their sight distance and visibility to oncoming drivers.

¹ 14 crossings in an hour is the threshold in this case since the population is less than 10,000 people. If the population was over 10,000 people, the threshold would be 20 crossings in an hour, which would still be met, since the 10 children would count as double (i.e., there would be 2 x 10 children + 5 adults = 25 crossings in an hour). If the crossing numbers were lower than what they are and fell below the threshold, the analyst would need to make a judgment on whether or not crossing volumes would increase to an amount higher than the threshold once the crossing was installed based on the activity generators in the area (e.g., park, community center, other surrounding land-uses).

REFERENCES

1. *NCHRP Report 562: Improving Pedestrian Safety at Unsignalized Crossings*. National Cooperative Highway Research Program, 2006.
<https://www.nap.edu/catalog/13962/improving-pedestrian-safety-at-unsignalized-crossings>.
2. Zegeer C., J. Stewart, H. Huang, P. Lagerwey, J. Feaganes, and B. Campbell. *Safety Effects of Marked vs. Unmarked Crosswalks*. Federal Highway Administration, September 2005.
<https://www.fhwa.dot.gov/publications/research/safety/04100/04100.pdf>
3. Kittelson & Associates, Inc. *Pedestrian Safety Practices White Paper*. Submitted to MDT January 22, 2018.

Attachment A Pedestrian Crossing Treatment Selection Matrix

MDT PEDESTRIAN CROSSING TREATMENT SELECTION MATRIX

2 Lane Facility					
Speed MPH	0 - 8,000 ADT	8,000 - 11,000 ADT	11,000 - 14,000 ADT	14,000 - 17,000 ADT	>17,000 ADT
0 - 30	C	C	C	E	A
35	C	C	E	E	A
40+	E	E	A	A	A

3 Lane Facility					
Speed MPH	0 - 8,000 ADT	8,000 - 11,000 ADT	11,000 - 14,000 ADT	14,000 - 17,000 ADT	>17,000 ADT
0 - 30	C	[C], E	[C], E	[C], A	[E], A
35	C	[C], E	[C], E	[E], A	[E], A
40+	E	[E], A	[E], A	[E], A	A

4 Lane Facility					
Speed MPH	0 - 8,000 ADT	8,000 - 11,000 ADT	11,000 - 14,000 ADT	14,000 - 17,000 ADT	>17,000 ADT
0 - 30	C	E	A	A	A
35	E	E	A	A	A
40+	E	A	A	A	A

5 Lane Facility					
Speed MPH	0 - 8,000 ADT	8,000 - 11,000 ADT	11,000 - 14,000 ADT	14,000 - 17,000 ADT	>17,000 ADT
0 - 30	[C], E	[C], A	[E], A	A	A
35	[C], E	[C], A	[E], A	A	A
40+	[E], A	[E], A	A	A	A

*Treatment recommendations based on NCHRP Report 562, FHWA's *Safety Effects of Marked vs. Unmarked Crosswalks*, the MUTCD, and input from MDT Staff.

LEGEND	
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