



## National Committee on Uniform Traffic Control Devices

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### Markings No. 1

<b>TECHNICAL COMMITTEE:</b>	Markings
<b>TOPIC:</b>	Crosswalk Markings
<b>STATUS:</b>	Approved by Markings, January 2011 Distributed as sponsor ballot, Spring 2011
<b>ORIGIN OF REQUEST:</b>	FHWA high visibility crosswalk marking study
<b>AFFECTED PORTIONS OF MUTCD:</b>	Section 3B.18

#### Summary:

During the process of gathering information, members of a recent ITE Traffic Engineering Council committee had the opportunity to talk to those making decisions regarding crosswalk marking installations. Observations made included a concern regarding the minimal attention given to selecting a style of crosswalk markings in certain regions and that the issue could become more critical with staff turnover. Another concern is that the MUTCD allows numerous options for crosswalks in order to give flexibility to highway agencies. Perhaps there is a need for more tightly prescribed allowable options in the MUTCD to provide clearer direction on which types of markings are best suited for certain conditions. However, in the absence of definitive research showing specific benefits of one crosswalk style versus others, highway agencies would likely oppose reduction in the flexibility currently afforded to them.

The Federal Highway Administration sponsored a study to investigate the relative daytime and nighttime visibility of three crosswalk marking patterns: transverse lines, continental, and bar pairs. In general, the study collected information on the distance from the crosswalk at which the participant verbally indicated its presence. Existing markings (six intersection and two midblock locations) and new markings installed for the study (nine midblock locations) were tested. For the sites where markings were newly installed, the detection distances to bar pairs and continental markings were similar, and they were statistically longer from the detection distance to the transverse markings both during the day and at night. For the existing midblock locations, a general observation is that the continental markings were detected at about twice the distance upstream as the transverse markings during daytime conditions. This increase in distance reflects 8 seconds of increased awareness of the presence of the crossing for 30-mi/h operating speeds. Drivers also rated the appearance of markings on a scale of A to F. These results mirrored the findings from the detection distance evaluation. Overall, participants preferred the continental and bar pairs markings over the transverse markings.

The Technical Brief for the FHWA study that is the basis for the recommendations can be found at: <http://www.fhwa.dot.gov/publications/research/safety/pedbike/10067/10067.pdf>.

The full research report for the study can be found at:

<http://www.fhwa.dot.gov/publications/research/safety/pedbike/10068/10068.pdf>

The following explains the basis for the changes in this section:

Line No.	Explanation
13-16 (§ 4)	<ul style="list-style-type: none"> <li>• Editorial change</li> </ul>
18-22 (§ 4.1)	<ul style="list-style-type: none"> <li>• Paragraph 4.1 has been added to introduce types of crosswalk marking patterns.</li> <li>• Figure 3B-19 was revised to show several types of crosswalk marking patterns and distinguish between basic and high-visibility crosswalk markings.</li> <li>• Bar pairs added because several states/cities (e.g., Seattle, Dallas) are now using them and recent FHWA study found similar detection distances to continental and bar pairs. <a href="http://www.fhwa.dot.gov/publications/research/safety/pedbike/10068/10068.pdf">http://www.fhwa.dot.gov/publications/research/safety/pedbike/10068/10068.pdf</a></li> <li>• Double continental added because discussed in Maryland’s Ped/Bike Guide, Virginia Guidelines for the Installation of Marked Crosswalks, and Salt Lake City’s “Crosswalk Marking Policy”.</li> </ul>
26-28 (§ 13, 14)	<ul style="list-style-type: none"> <li>• Paragraph 13 and first sentence of 14 relocated from later in this section near the start of this section where marking patterns are defined.</li> <li>• The 45° definition of a diagonal line has been removed.</li> <li>• Paragraph 13 revised to expand the definition of a high-visibility crosswalk marking pattern.</li> </ul>
33 (§ 5)	<ul style="list-style-type: none"> <li>• Editorial change</li> </ul>
36 & 38 (§ 6)	<ul style="list-style-type: none"> <li>• Editorial change</li> </ul>
40 (§ 7)	<ul style="list-style-type: none"> <li>• Editorial change</li> </ul>
42 (§ 8)	<ul style="list-style-type: none"> <li>• Editorial change</li> </ul>
60-61 (§ 14.1)	<ul style="list-style-type: none"> <li>• Remainder of Paragraph 14 moved here to start the information regarding where to use high visibility markings.</li> <li>• Editorial changes</li> </ul>
73-74 (§ 11)	<ul style="list-style-type: none"> <li>• The new text adds high visibility markings for non-intersection locations based on the findings of the recent FHWA study that found that continental and bar pairs are seen at longer distances compared to two transverse lines.</li> </ul>
78-81 (§ 11.1)	<ul style="list-style-type: none"> <li>• Engineering judgment permits use of two transverse lines at non-intersection locations when appropriate.</li> </ul>
84-85 (§ 11.2)	<ul style="list-style-type: none"> <li>• The 35 mph speed limit value was selected to be consistent with the pedestrian signal warrant. It also considers the survivability of pedestrians when hit (pedestrian hit at 40 mph has an 85% chance of being killed, at 30 mph the likelihood goes down to 45% while at 20 mph the fatality rate is only 5% - UK DOT, Killing Speed and Saving Lives, London 1987).</li> <li>• A review of state and selected city websites found the following locations discuss 8 ft or greater minimum crosswalk widths: Georgia; Oklahoma; South Dakota; Washington; Vermont; Oregon; Alaska; Utah; Arizona; Ohio; Portland, Maine; Wichita, Kansas; Boulder, Colorado; Broward County, Florida; Palm Beach County, Florida; Salt Lake City, Utah; Seattle, Washington; Phoenix, Arizona; Washington, DC. (ITE-TENC-109-01).</li> </ul>
93-101 (§ 13, 14)	<ul style="list-style-type: none"> <li>• Paragraphs relocated.</li> </ul>

104-109 (¶ 15)	<ul style="list-style-type: none"> <li>• Text added to provide guidance on dimensions, especially for bar pairs.</li> </ul>
130-131 Fig 3B-17	<ul style="list-style-type: none"> <li>• Figure 3B-17 has been revised to a high-visibility crosswalk marking pattern instead of a basic crosswalk marking pattern.</li> </ul>
134 Fig 3B-19	<ul style="list-style-type: none"> <li>• Existing Figure 3B-19 replaced with new Figure 3B-19</li> </ul>

**Recommendation:**

Based on the research described above, the Markings Technical Committee determined that changes shown in the following pages should be made to Section 3B.18, Crosswalk Markings, to implement the research findings.

**Recommended Changes to the MUTCD:**

The proposed changes to Section 3B.18 are shown in the following pages. Additions are indicated by blue underline, ~~deletions~~ are indicated by red double strikethrough.

1 **Section 3B.18 Crosswalk Markings**

2  
3 Support:

4 01 Crosswalk markings provide guidance for pedestrians who are crossing roadways by  
5 defining and delineating paths on approaches to and within signalized intersections, and on  
6 approaches to other intersections where traffic stops.

7 02 In conjunction with signs and other measures, crosswalk markings help to alert road users of  
8 a designated pedestrian crossing point across roadways at locations that are not controlled by  
9 traffic control signals or STOP or YIELD signs.

10 03 At non-intersection locations, crosswalk markings legally establish the crosswalk.

11  
12 **Standard:**

13 04 ~~When crosswalk lines are used, they shall consist of solid white lines that mark the  
14 crosswalk. They shall not be less than 6 inches or greater than 24 inches in width.~~

15 Crosswalk markings shall be white. When used, lines shall not be less than 6 inches or  
16 greater than 24 inches in width.

17  
18 Support:

19 04.1 Crosswalk markings are classified as basic or high visibility. Basic crosswalk markings  
20 consist of two transverse lines. High visibility markings consist of diagonal or longitudinal lines  
21 parallel to traffic flow with or without transverse lines. Figure 3B-19 presents examples of  
22 crosswalk markings. [note: Figure 3B-19 has been revised]

23  
24 Option:

25  
26 13 For added visibility, the area of the crosswalk may be marked with a high visibility  
27 crosswalk marking pattern, ~~which consist of white diagonal lines at a 45-degree angle to the line  
28 of the crosswalk or white longitudinal lines parallel to traffic flow as shown in Figure 3B-19.~~

29 14 When diagonal or longitudinal lines are used to mark a crosswalk, the transverse crosswalk  
30 lines may be omitted.

31  
32 Guidance:

33 05 *If two transverse lines are used to mark a crosswalk (basic crosswalk marking), the gap  
34 between the lines should not be less than 6 feet. If diagonal or longitudinal lines are used without  
35 transverse lines to mark a crosswalk, the crosswalk should be not less than 6 feet wide.*

36 06 ~~Crosswalk~~ Transverse crosswalk lines, if used on both sides of the crosswalk, should extend  
37 across the full width of pavement or to the edge of the intersecting crosswalk to discourage  
38 diagonal walking between crosswalks ~~(see Figures 3B-17 and 3B-19).~~

39 07 *At locations controlled by traffic control signals or on approaches controlled by STOP or  
40 YIELD signs, crosswalk lines=markings should be installed where engineering judgment  
41 indicates they are needed to direct pedestrians to the proper crossing path(s).*

42 08 *Crosswalk lines=markings should not be used indiscriminately. An engineering study should  
43 be performed before a marked crosswalk is installed at a location away from a traffic control  
44 signal or an approach controlled by a STOP or YIELD sign. The engineering study should  
45 consider the number of lanes, the presence of a median, the distance from adjacent signalized  
46 intersections, the pedestrian volumes and delays, the average daily traffic (ADT), the posted or*

47 *statutory speed limit or 85<sup>th</sup>-percentile speed, the geometry of the location, the possible*  
48 *consolidation of multiple crossing points, the availability of street lighting, and other*  
49 *appropriate factors.*

50 <sup>09</sup> *New marked crosswalks alone, without other measures designed to reduce traffic speeds,*  
51 *shorten crossing distances, enhance driver awareness of the crossing, and/or provide active*  
52 *warning of pedestrian presence, should not be installed across uncontrolled roadways where the*  
53 *speed limit exceeds 40 mph and either:*

54 *A. The roadway has four or more lanes of travel without a raised median or pedestrian*  
55 *refuge island and an ADT of 12,000 vehicles per day or greater; or*

56 *B. The roadway has four or more lanes of travel with a raised median or pedestrian refuge*  
57 *island and an ADT of 15,000 vehicles per day or greater.*

58

59 **Option:**

60 <sup>14.1</sup> The high visibility crosswalk ~~This type of~~ marking may be used at locations where  
61 ~~substantial numbers of~~ pedestrians cross without any other traffic control device, at locations  
62 where physical conditions are such that added visibility of the crosswalk is desired, or at places  
63 where a pedestrian crosswalk might not be expected.

64

65 **Support:**

66 <sup>10</sup> Chapter 4F contains information on Pedestrian Hybrid Beacons. Section 4L.03 contains  
67 information regarding Warning Beacons to provide active warning of a pedestrian's presence.  
68 Section 4N.02 contains information regarding In-Roadway Warning Lights at crosswalks.  
69 Chapter 7D contains information regarding school crossing supervision.

70

71 **Guidance:**

72 <sup>11</sup> *Because non-intersection pedestrian crossings are generally unexpected by the road user,*  
73 *warning signs (see Section 2C.50) and high visibility crosswalk markings (such as continental,*  
74 *bar pairs, or ladder markings, as shown in Figure 3B-19) should be installed for ~~all~~-marked*  
75 *crosswalks at non-intersection locations and adequate visibility should be provided by parking*  
76 *prohibitions.*

77

78 **Option:**

79 <sup>11.1</sup> A crosswalk marking consisting of two transverse lines may be used at a non-intersection  
80 location where engineering judgment determines that they would be adequate at the given  
81 location.

82

83 **Guidance:**

84 <sup>11.2</sup> If the speed limit is greater than 35 mph at the non-intersection uncontrolled pedestrian  
85 crossing, the high visibility crosswalk marking, if used, should not be less than 8 feet wide.

86

87 **Support:**

88 <sup>12</sup> Section 3B.16 contains information regarding placement of stop line markings near  
89 crosswalk markings.

90

91

92

93 ~~Option:~~

94 13 ~~For added visibility, the area of the crosswalk may be marked with white diagonal lines at a~~  
95 ~~45-degree angle to the line of the crosswalk or with white longitudinal lines parallel to traffic~~  
96 ~~flow as shown in Figure 3B-19.~~

97 14 ~~When diagonal or longitudinal lines are used to mark a crosswalk, the transverse crosswalk~~  
98 ~~lines may be omitted. This type of marking may be used at locations where substantial numbers~~  
99 ~~of pedestrians cross without any other traffic control device, at locations where physical~~  
100 ~~conditions are such that added visibility of the crosswalk is desired, or at places where a~~  
101 ~~pedestrian crosswalk might not be expected.~~

102  
103 *Guidance:*

104 15 *If used, the diagonal or longitudinal lines within the continental, ladder, or diagonal*  
105 *markings, should be 12 to 24 inches wide and separated by gaps of 12 to 60 inches. If used, a*  
106 *bar pair should consist of two 8 inch stripes separated by 8 inches to form a 24 inch wide bar*  
107 *pair. Bar pairs should be separated by gaps of 24 to 60 inches. The design of the lines and gaps*  
108 *should avoid the wheel paths if possible, and the gap between the lines should not exceed 2.5*  
109 *times the width of the diagonal lines, ~~or~~ longitudinal lines, or bar pair.*

110  
111 *Option:*

112 16 *When an exclusive pedestrian phase that permits diagonal crossing of an intersection is*  
113 *provided at a traffic control signal, a marking as shown in Figure 3B-20 may be used for the*  
114 *crosswalk.*

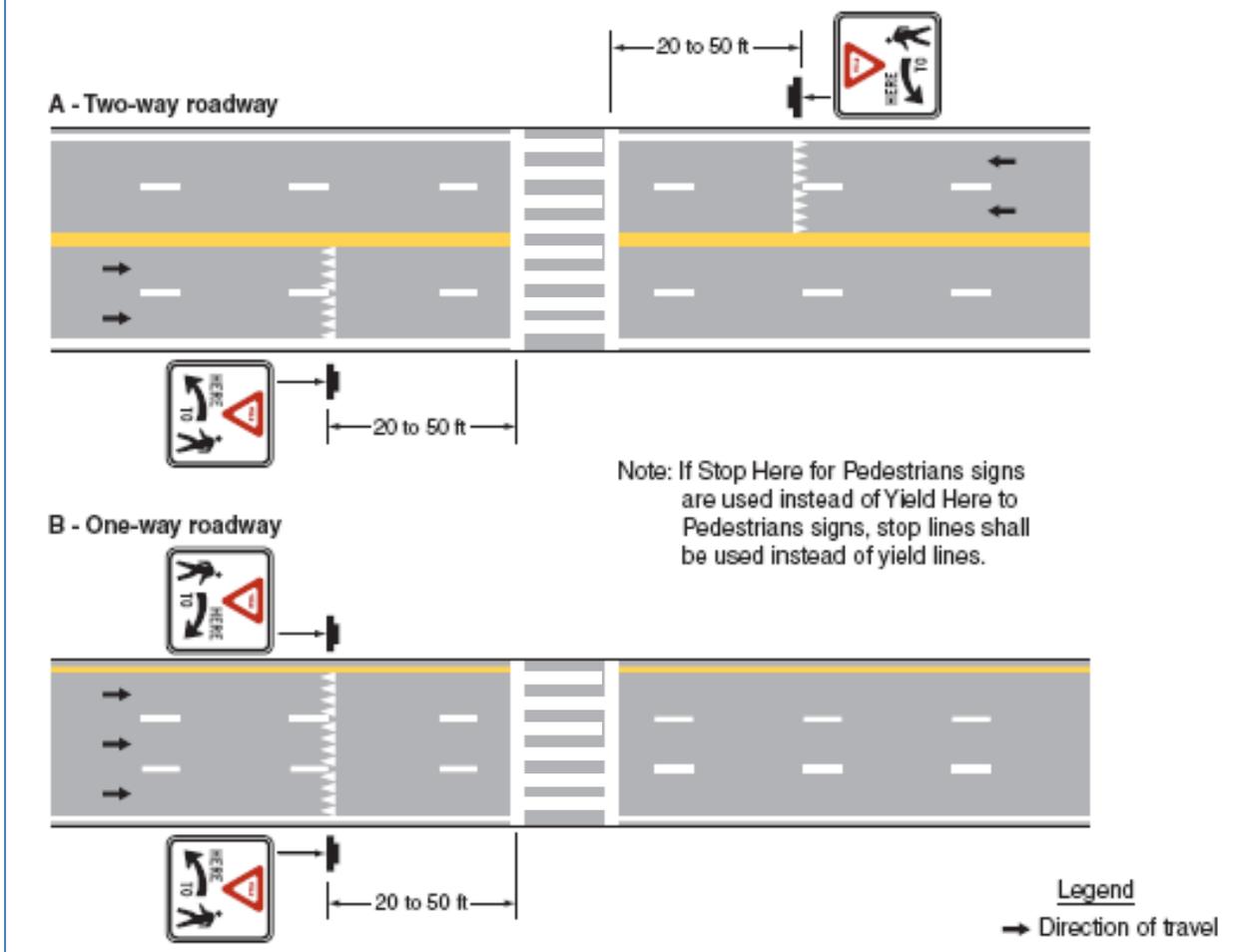
115  
116 *Guidance:*

117 17 *Crosswalk markings should be located so that the curb ramps are within the extension of the*  
118 *crosswalk markings.*

119  
120 *Support:*

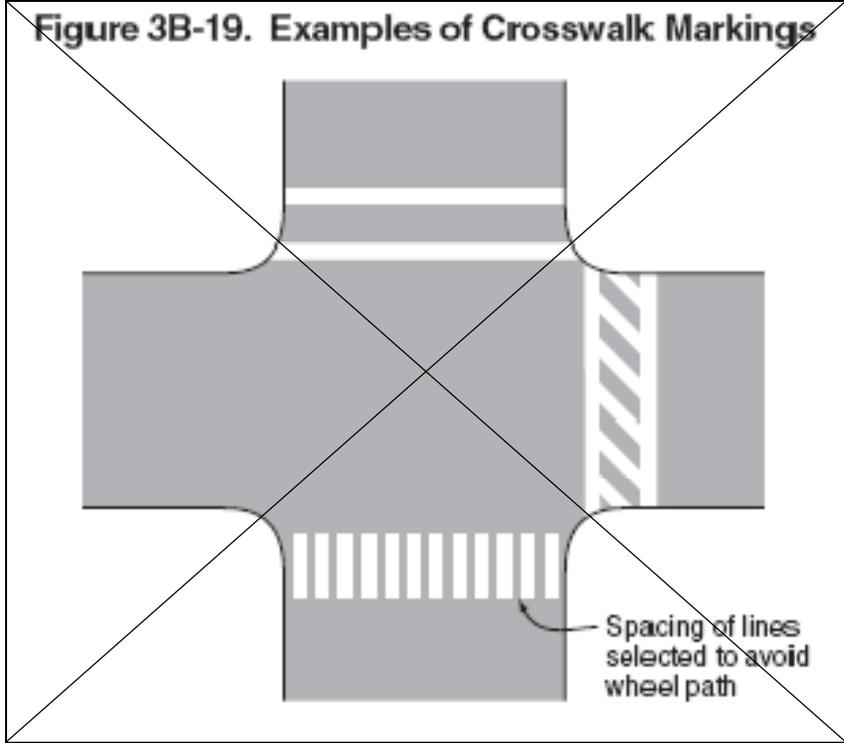
121 18 *Detectable warning surfaces mark boundaries between pedestrian and vehicular ways where*  
122 *there is no raised curb. Detectable warning surfaces are required by 49 CFR, Part 37 and by the*  
123 *Americans with Disabilities Act (ADA) where curb ramps are constructed at the junction of*  
124 *sidewalks and the roadway, for marked and unmarked crosswalks. Detectable warning surfaces*  
125 *contrast visually with adjacent walking surfaces, either light-on-dark, or dark-on-light. The*  
126 *“Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities*  
127 *(ADAAG)” (see Section 1A.11) contains specifications for design and placement of detectable*  
128 *warning surfaces.*

**Figure 3B-17. Examples of Yield Lines at Unsignalized Midblock Crosswalks**



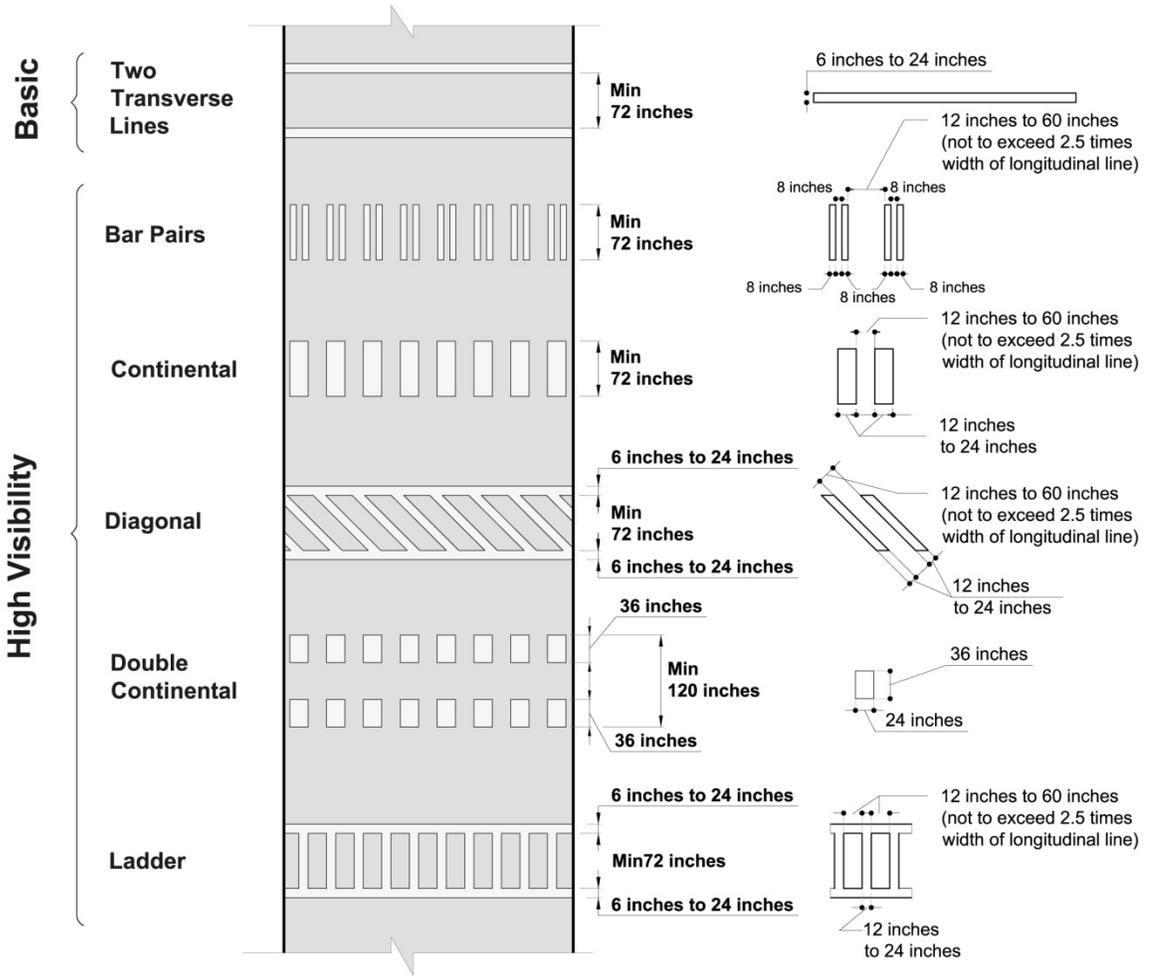
**Figure 3B-17. Examples of Yield Lines at Unsignalized Midblock Crosswalks**  
 [Figure revised by adding longitudinal markings to crosswalks]

130  
 131  
 132  
 133



134

[Existing Figure 3B-19 replaced with new Figure 3B-19 on next page]



135  
136  
137

**Figure 3B-19. Examples of Crosswalk Markings**  
[New Figure 3B-19 to replace existing figure]