Designing for Pedestrians

- Marking Crosswalks at Signalized intersections
- High Visibility Markings
- Median Crossovers
- Shortening the Distance
- Marked vs. Unmarked Crosswalks at Unsignalized Intersections
- Rapid Flashing Beacon
MUTCD- CROSSWALK Definition

44. Crosswalk—(a) that part of a roadway at an intersection included within the connections of the lateral lines of the sidewalks on opposite sides of the highway measured from the curbs or in the absence of curbs, from the edges of the traversable roadway, and in the absence of a sidewalk on one side of the roadway, the part of a roadway included within the extension of the lateral lines of the sidewalk at right angles to the center line; (b) any portion of a roadway at an intersection or elsewhere distinctly indicated as a pedestrian crossing by pavement marking lines on the surface, which might be supplemented by contrasting pavement texture, style, or color.

45. Crosswalk Lines—white pavement marking lines that identify a crosswalk.

2009 MUTCD – Page 13, Sect. 1A.13
MUTCD: STOP and Yield Lines

- **Guidance:**

- 10 If used, stop and yield lines should be placed a minimum of 4 feet in advance of the nearest crosswalk line at controlled intersections, except for yield lines at roundabouts as provided for in Section 3C.04 and at midblock crosswalks. In the absence of a marked crosswalk, the stop line or yield line should be placed at the desired stopping or yielding point, but should not be placed more than 30 feet or less than 4 feet from the nearest edge of the intersecting traveled way.

- 11 Stop lines at midblock signalized locations should be placed at least 40 feet in advance of the nearest signal indication (see Section 4D.14).

- 12 If yield or stop lines are used at a crosswalk that crosses an uncontrolled multi-lane approach, the yield lines or stop lines should be placed 20 to 50 feet in advance of the nearest crosswalk line, and parking should be prohibited in the area between the yield or stop line and the crosswalk (see Figure 3B-17).
(a) Every pedestrian crossing a roadway at any point other than within a marked crosswalk or within an unmarked crosswalk at an intersection shall yield the right-of-way to all vehicles upon the roadway.

(b) Any pedestrian crossing a roadway at a point where a pedestrian tunnel or overhead pedestrian crossing has been provided shall yield the right-of-way to all vehicles upon the roadway.

(c) Between adjacent intersections at which traffic-control signals are in operation pedestrians shall not cross at any place except in a marked crosswalk.

(d) No pedestrian shall cross a roadway intersection diagonally unless authorized by official traffic-control devices; and, when authorized to cross diagonally, pedestrians shall cross only in accordance with the official traffic-control devices pertaining to such crossing movements.

(Acts 1980, No. 80-434, p. 604, §5-103.)
PEDESTRIANS' RIGHT-OF-WAY IN CROSSWALKS

(a) When traffic-control signals are not in place or not in operation the driver of a vehicle shall yield the right-of-way, slowing down or stopping if need be to so yield, to a pedestrian crossing the roadway within a crosswalk when the pedestrian is upon the half of the roadway upon which the vehicle is traveling, or when the pedestrian is approaching so closely from the opposite half of the roadway as to be in danger.

(b) No pedestrian shall suddenly leave a curb or other place of safety and walk or run into the path of a vehicle which is so close as to constitute an immediate hazard.

(c) Subsection (a) shall not apply under the conditions stated in Section 32-5A-212(b).

(d) Whenever any vehicle is stopped at a marked crosswalk or at any unmarked crosswalk at an intersection to permit a pedestrian to cross the roadway, the driver of any other vehicle approaching from the rear shall not overtake and pass such stopped vehicle.

(Acts 1980, No. 80-434, p. 604, §5-102.)
Alabama Code - Section 32-5A-213: DRIVERS TO EXERCISE CARE

- Notwithstanding other provisions of this chapter or the provisions of any local ordinance, every driver of a vehicle shall exercise due care to avoid colliding with any pedestrian and shall give warning by sounding the horn when necessary and shall exercise proper precaution upon observing any child or any obviously confused, incapacitated or intoxicated person.

(Acts 1980, No. 80-434, p. 604, §5-104.)
MUTCD - 94. Intersection—intersection is defined as follows:

(a) The area embraced within the prolongation or connection of the lateral curb lines, or if none, the lateral boundary lines of the roadways of two highways that join one another at, or approximately at, right angles, or the area within which vehicles traveling on different highways that join at any other angle might come into conflict.

(b) The junction of an alley or driveway with a roadway or highway shall not constitute an intersection, unless the roadway or highway at said junction is controlled by a traffic control device.

(c) If a highway includes two roadways that are 30 feet or more apart (see definition of Median), then every crossing of each roadway of such divided highway by an intersecting highway shall be a separate intersection.

(d) If both intersecting highways include two roadways that are 30 feet or more apart, then every crossing of any two roadways of such highways shall be a separate intersection.
MUTCD - 94. Intersection—intersection is defined as follows: (cont’d)

(e) At a location controlled by a traffic control signal, regardless of the distance between the separate intersections as defined in (c) and (d) above:

(1) If a stop line, yield line, or crosswalk has not been designated on the roadway (within the median) between the separate intersections, the two intersections and the roadway (median) between them shall be considered as one intersection;

(2) Where a stop line, yield line, or crosswalk is designated on the roadway on the intersection approach, the area within the crosswalk and/or beyond the designated stop line or yield line shall be part of the intersection; and

(3) Where a crosswalk is designated on a roadway on the departure from the intersection, the intersection shall include the area extending to the far side of such crosswalk.
MUTCD- Pedestrian Definitions

- 138. Pedestrian—a person on foot, in a wheelchair, on skates, or on a skateboard.
- 139. Pedestrian Change Interval—an interval during which the flashing UPRAISED HAND (symbolizing DONT WALK) signal indication is displayed.
- 140. Pedestrian Clearance Time—the time provided for a pedestrian crossing in a crosswalk, after leaving the curb or shoulder, to travel to the far side of the traveled way or to a median.
- 141. Pedestrian Facilities—a general term denoting improvements and provisions made to accommodate or encourage walking.
- 142. Pedestrian Hybrid Beacon—a special type of hybrid beacon used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a street or highway at a marked crosswalk.
- 143. Pedestrian Signal Head—a signal head, which contains the symbols WALKING PERSON (symbolizing WALK) and UPRAISED HAND (symbolizing DONT WALK), that is installed to direct pedestrian traffic at a traffic control signal.
ALDOT STANDARD DRAWING for Median Crossovers/Turn Lanes

MAY NEED TO MODIFY WHEN PEDESTRIANS are present: CROSSWALKS, MEDIAN REFUGE, BULBOUT OR CORNER REFUGE ISLANDS.

<table>
<thead>
<tr>
<th>VEHICLE</th>
<th>TURN RADIUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>40’</td>
</tr>
<tr>
<td>SU</td>
<td>50’</td>
</tr>
<tr>
<td>WB40, WB50</td>
<td>75’</td>
</tr>
</tbody>
</table>
Raised Medians and Pedestrian Refugee Areas

- Pedestrian crashes account for about 12 percent of all traffic fatalities annually.
- Over 75 percent of these fatalities occur at non-intersection locations. The *median* is the area between opposing lanes of traffic—a median can either be open (pavement markings only) or they can be channelized (raised medians or islands) to separate various road users.
- Providing raised medians or pedestrian refuge areas at pedestrian crossings at marked crosswalks has demonstrated a 46 percent reduction in pedestrian crashes. At unmarked crosswalk locations, pedestrian crashes have been reduced by 39 percent. Installing raised pedestrian refuge islands on the approaches to unsignalized intersections has had the most impact reducing pedestrian crashes.
Median Refuge Islands

High Visibility Markings

Overhead Signs

Flaggers
Refuge island

- Median refuge provides calming and access control for both vehicles and pedestrians.
- Can be small refuge like one shown.
“Bulbout” at intersections

Narrows crosswalk-shortens distance for pedestrians, can be used on roads with on street parking.

Use where only occasional truck traffic.

Traffic calming measure.
Median Crossovers/Turn Lanes

- ALDOT Standard drawing for medians often used for intersection design.
- All intersections May need to add sidewalks and refuge Islands.
- Use Compound Curves or refuge islands in the radius to shorten crossing distances.
Huntsville, AL Old 431/ CO. Rd 28

- Unsignalized Intersection with large radii
- Refuge Islands
- No median refuge islands
- No High Visibility Markings
- Worn Paint at CrossWalks
Huntsville, AL – US 72 @ Ben Graves/Putman Dr.

Do these solve the problem? Do we really want to build these? Can we meet ADA? Will they be used? Is there a better way?

BUILD BETTER CROSSWALKS.
Most Controlled intersections should have High Visibility marked crosswalks...to direct pedestrians where to cross and direct drivers attention to where to expect pedestrians.......
Crosswalk – HIGH VISIBILITY MARKINGS

CONTINENTAL DESIGN MARKINGS LIKE THE LADDER (ALDOT) WITHOUT THE TRAVERSE LINES

3D MARKINGS COMING UP OUT THE PAVEMENT-OPTICAL ILLUSION – USING IN INDIA AND CHINA
FHWA- Safety Effects of Marked versus Unmarked Crosswalks at Uncontrolled Locations

Publication: HRT-04-100
Pedestrian Crashes – Marked vs Unmarked

Figure 18. Pedestrian crash rate versus type of crossing.
Uncontrolled Multi-Lane Intersections

- **Standard:**
  - If yield (stop) lines are used at a crosswalk that crosses an uncontrolled multi-lane approach, Yield Here To (Stop Here For) Pedestrians (R1-5 series) signs (see Section 2B.11) shall be used.

- **Guidance:**
  - Yield (stop) lines and Yield Here To (Stop Here For) Pedestrians signs should not be used in advance of crosswalks that cross an approach to or departure from a roundabout.

- **Support:**
  - When drivers yield or stop too close to crosswalks that cross uncontrolled multi-lane approaches, they place pedestrians at risk by blocking other drivers’ views of pedestrians and by blocking pedestrians’ views of vehicles approaching in the other lanes.

- December 2009 Sect. 3B.15 to 3B.16
MUTCD: For Unsignalized Crosswalks

- Crosswalk lines should not be used indiscriminately. An engineering study should be performed before a marked crosswalk is installed at a location away from a traffic control signal or an approach controlled by a STOP or YIELD sign. The engineering study should consider the number of lanes, the presence of a median, the distance from adjacent signalized intersections, the pedestrian volumes and delays, the average daily traffic (ADT), the posted or statutory speed limit or 85th-percentile speed, the geometry of the location, the possible consolidation of multiple crossing points, the availability of street lighting, and other appropriate factors.
NEW marked crosswalks alone, without other measures designed to reduce traffic speeds, shorten crossing distances, enhance driver awareness of the crossing, and/or provide active warning of pedestrian presence, should not be installed across uncontrolled roadways where the speed limit exceeds 40 mph and either:

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

B. The roadway has four or more lanes of travel with a raised median or pedestrian refuge island and an ADT of 15,000 vehicles per day or greater.
Section 2B.11 Yield Here To Pedestrians Signs and Stop Here For Pedestrians Signs (R1-5 Series)

- **Standard:** Yield Here To (Stop Here For) Pedestrians (R1-5, R1-5a, R1-5b, or R1-5c) signs (see Figure 2B-2) shall be used if yield (stop) lines are used in advance of a marked crosswalk that crosses an uncontrolled multi-lane approach. The Stop Here for Pedestrians signs shall only be used where the law specifically requires that a driver must stop for a pedestrian in a crosswalk. The legend STATE LAW may be displayed at the top of the R1-5, R1-5a, R1-5b, and R1-5c signs, if applicable.

- **Guidance:** If yield (stop) lines and Yield Here To (Stop Here For) Pedestrians signs are used in advance of a crosswalk that crosses an uncontrolled multi-lane approach, they **should be placed 20 to 50 feet in advance of the nearest crosswalk line** (see Section 3B.16 and Figure 3B-17), and parking **should be prohibited in the area between the yield (stop) line and the crosswalk.**

- **Option:** Yield Here To (Stop Here For) Pedestrians signs may be used in advance of a crosswalk that crosses an uncontrolled multi-lane approach to indicate to road users where to yield (stop) even if yield (stop) lines are not used.
MUTCD-Figure 2B-2. Unsignalized Pedestrian Crosswalk Signs

Figure 2B-2. Unsignalized Pedestrian Crosswalk Signs

- **R1-5**: Yield Here To Pedestrians
- **R1-5a**: Here To For Pedestrians
- **R1-5b**: Stop Here For Pedestrians
- **R1-5c**: Stop Here For Pedestrians
- **R1-6**: State Law Yield To Pedestrians Within Crosswalk
- **R1-6a**: State Law Stop For Pedestrians Within Crosswalk
- **R1-9**: State Law Yield To Pedestrians
- **R1-9a**: State Law Stop For Pedestrians

* The legend STATE LAW is optional. A fluorescent yellow-green background color may be used instead of yellow for this sign.

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05 A Pedestrian Crossing (W11-2) warning sign may be placed overhead or may be post-mounted with a diagonal downward pointing arrow (W16-7P) plaque at the crosswalk location where Yield Here To (Stop Here For) Pedestrians signs have been installed in advance of the crosswalk.
US 31 Vestavia Hills
Speed Limit 40 MPH
Signalized Intersection.
Some intersections US 31 corridor are marked
great like this one. Could add islands and
wider crosswalks.

Other intersections along same corridor city not marked. Corridors should be evaluated for consistency across city boundaries.
C.05 Warrant 4, Pedestrian Volume

- **Support:**
  01. The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.

- **Standard:**
  02. The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that one of the following criteria is met:
    - For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-5; or
    - For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve in Figure 4C-7.

- **Option:**
  03. If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 35 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000,
    - Figure 4C-6 may be used in place of Figure 4C-5 to evaluate Criterion A in Paragraph 2, and Figure 4C-8 may be used in place of Figure 4C-7 to evaluate Criterion B in Paragraph 2.
Pedestrian Hybrid Beacon-Sequence

**Figure 4F-3.** Sequence for a Pedestrian Hybrid Beacon

1. Dark Until Activated
2. Flashing Yellow Upon Activation
3. Steady Yellow
4. Steady Red During Pedestrian Walk Interval
5. Alternating Flashing Red During Pedestrian Clearance Interval
6. Dark Again Until Activated

**Legend**
- SY: Steady yellow
- FY: Flashing yellow
- SR: Steady red
- FR: Flashing red
Section 4F.01 Application of Pedestrian Hybrid Beacons

Support:
- A pedestrian hybrid beacon is a special type of hybrid beacon used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a street or highway at a marked crosswalk.

Option:
- A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C), or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal.

Standard:
- If used, pedestrian hybrid beacons shall be used in conjunction with signs and pavement markings to warn and control traffic at locations where pedestrians enter or cross a street or highway. A pedestrian hybrid beacon shall only be installed at a marked crosswalk.
Questions?

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