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INTRODUCING THE MUTCD 11TH EDITION

In This Issue…

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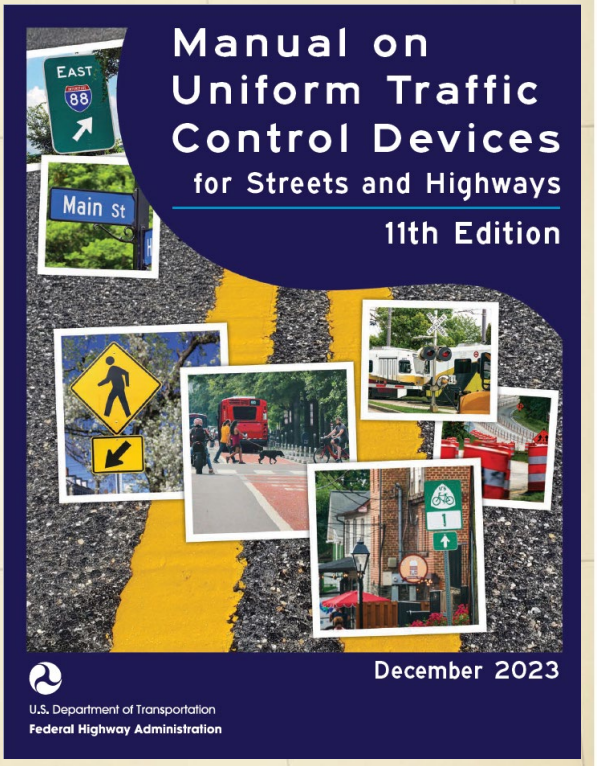
Overview

The Manual on Uniform Traffic Control Devices (MUTCD) is the national standard for traffic control devices, such as signing, pavement markings, and traffic signals. The MUTCD undergoes periodic updates, and in December 2023 the 11th edition was released, replacing the previous version. Upon its release, the 11th edition is now the effective standard that should be followed throughout the United States, including on military installations.

The MUTCD is available on FHWA's website: https://mutcd.fhwa.dot.gov/



The first edition of the MUTCD was released in 1935, recognizing the need for standards with regard to signing. It classified signs into regulatory, warning and guide categories. This was followed by many subsequent editions leading to the current version. With the 1948 edition, the need to simplify sign wording messages was recognized, and subsequently the 1954 update required white letters on a red background for STOP signs while also introducing the YIELD sign. Many standards for guide signs still used today were first introduced in the 1961 version. Additional updates were released in 1971, 1978, and 1988 - - with the 1971 version being the first to adopt the *should*, *shall* and *may* text format. The next versions were released in 2000, 2003, and 2009. Though the manual was available online as of the 2000 edition, the 2003 version condensed white space in the manual, significantly reducing the number of pages while maintaining the amount of content. The 2009 edition (revised in 2012 and again in 2022) was in use for almost 14 years, the longest of any version.

This bulletin will focus on introducing the 11th edition of the MUTCD, particularly highlighting important changes most relevant to installations. Note that it is not intended to be a complete listing of all changes.

MUTCD Applicability

The MUTCD applies to "*any street, roadway or bikeway open to public travel, either publicly or privately owned*," including government office complexes. This includes military installations, so the fact that installations are access controlled does not exclude the need to comply with the MUTCD. Parking areas are excluded from MUTCD compliance, but that does not mean that traffic control devices used in parking areas can contradict or oppose the MUTCD.

The MUTCD now requires that traffic control devices be installed with direction from individuals that are authorized and qualified to conduct traffic control device activities. Decisions for implementation are to be made by individuals who have appropriate levels of expertise and experience to make traffic control device decisions. This enforces the need for qualified engineering support for implementation of traffic control devices. SDDCTEA is available to provide this support to installations.

Signing

There are several relevant signing-related changes in the MUTCD as discussed in this section.

Sign Symbols. This version of the MUTCD reinforces the prohibition of using sign symbols not approved in the Standard Highway Signs manual. It adds that where a standard sign is a symbol legend, an alternative word legend shall not be used in place of the symbol except if allowed in the MUTCD.

Yield and Stop Signs for Speed Control. This version specifies as a standard that YIELD and STOP signs shall not be used for speed control. Under previous versions, it was only guidance. Other methods of traffic control are available that do not reduce the effectiveness of traffic control devices.

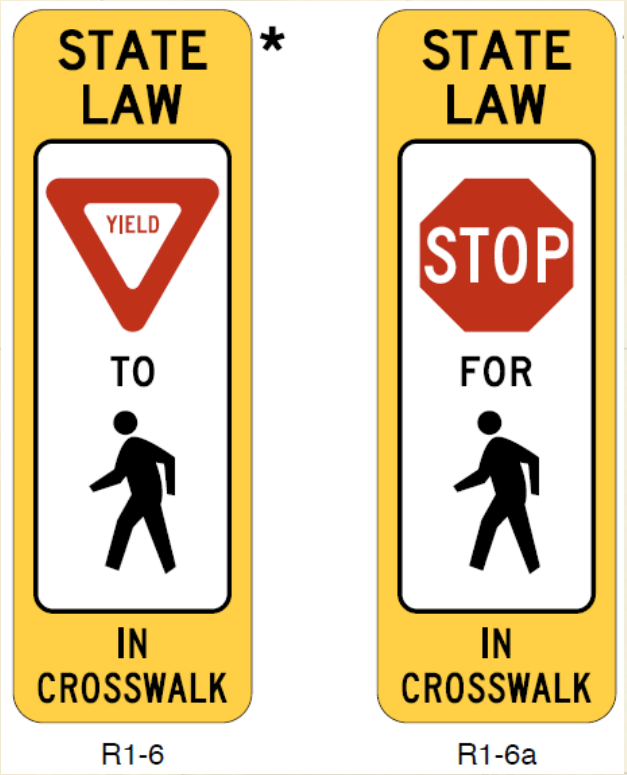
Intersection Traffic Control Guidance. The manual provides guidance on selecting the appropriate form of traffic control, including No Control, Yield Control, Minor Road Stop Control, and All-Way Stop Control. All-Way Stop control warrants were previously published in the MUTCD, but the current warrants are more robust and are presented later in this bulletin. It also includes guidance on helping to designate the minor road when Minor Road Stop Control is used. Previously, the Manual stated that the roadway with lower traffic volumes should be the one placed under stop control, but this version allows other considerations such as one intersecting a designated through roadway, with a lower functional classification, with the lower speed limit, or one that intersects a higher priority roadway. Sight distance can also be considered as a reason for stopping one roadway versus another if the traffic volumes are approximately equal.

Yield Here To (Stop Here For) Pedestrians Signs. The (Yield Here To) (Stop Here For) Pedestrians (R1-5 and R1-5b) signs must be used if yield (stop) lines are used in advance of a crosswalk, but only where it crosses a multi-lane road.

R1-5 and R1-5b Signs

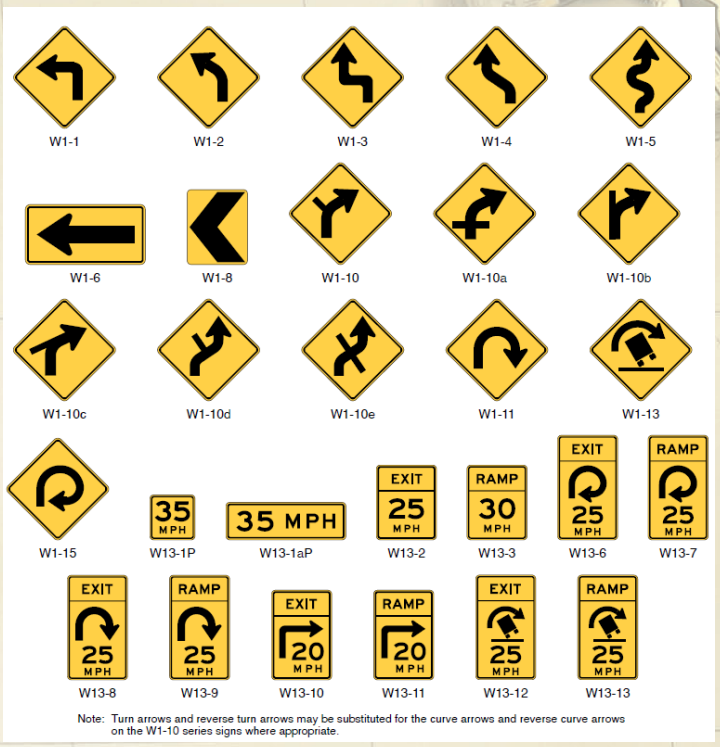
In-Street Pedestrian Crossing Signs. Regulations are more defined for installation of the In-Street Pedestrian Crossing (R1-6 or R1-6a) sign. These signs may only be used as a supplement to permanently mounted roadside signs, particularly the pedestrian warning sign with diagonal downward arrow placard. They may not be used at signalized crossings, crossings spanning stop- or yield-controlled approaches, or where hybrid beacons are used. They also may not be used in advance of the crosswalk or be permanently mounted roadside. When used, they are to be mounted on a weighted base and located in the roadway at the crosswalk location on the center line, on a median island, on a lane line, or on an edge line.

R1-6 Sign Series



R1-6 R1-6a

MUTCD Figure 2C-1: Horizontal Alignment Signs and Plaques



Gate Arms. The manual adds the requirement for a minimum width for retroreflective sheeting used for gate arms. The minimum width is 4 inches, which was required by SDDCTEA's DoD Supplement to the MUTCD, but not previously by the MUTCD itself.

Horizontal Alignment Sign Criteria. New criteria have been established for the use of horizontal alignment warning signs. The criteria consider roadway Average Daily Traffic (ADT) volume versus roadway classification to determine if a treatment is required, recommended, or optional; then based on the speed differential between the roadway speed and the horizontal curve speed which treatment is recommended. Treatments can include pavement markings, advance horizontal alignment warning signs, delineators, chevrons, or the One Direction Large Arrow sign.

A new version of an advisory speed sign, W13-1aP, is included that is intended to be mounted beneath the One-Direction Large Arrow sign. The width of the placard is 48 inches by 15 inches if used with a conventional size arrow sign. The placard matches the width of the Arrow but is not as high. Previously, some agencies would mount a W13-1P, or a square-shaped advisory speed sign beneath the Arrow sign, which was allowed, but in practice this was rare.

When advance horizontal alignment warning signs are being considered, the Curve (W1-2) sign is the default, unless another criterion is met. The criteria include the use of a Turn (W1-1) sign if the curve advisory speed is 30 mph or less; or, if there are changes in roadway alignment in opposite directions that are curves separated by a tangent distance of less than 600 feet, a Reverse Turn (W1-3) sign (for speeds of 30 mph or less) or Reverse Curve (W1-4) sign (for speeds greater than 30 mph) should be used. The differentiation language appears as guidance criteria in the current edition versus a standard in the previous version.

All-Way Stop Warrants

This version of the MUTCD has strengthened a warrant evaluation process for determining the appropriateness of All-Way Stop control. There are now 5 warrants for consideration as discussed below, and all are presented as guidance criteria, not definite requirements. Even if one or more warrant is met at an intersection, All-Way Stop may not necessarily be the most appropriate control, and another form of traffic control may be better. The warrants are:

- ☑ **Warrant A: Crash Experience.** All-Way Stop control may be installed at an intersection where an engineering study indicates that for a four-leg intersection, there are five or more reported crashes in a 12-month period or six or more reported crashes in a 36-month period that could be corrected by the installation of All-Way Stop control; or for a three-leg intersection, there are four or more reported crashes in a 12-month period or five or more reported crashes in a 36-month period that could be corrected by the installation of All-Way Stop control.
- ☑ **Warrant B: Sight Distance.** All-Way Stop control may be installed at an intersection where an engineering study indicates that sight distance on the minor-road approaches controlled by a STOP sign is not adequate for a vehicle to turn onto or cross the major (uncontrolled) road. At such a location, a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop.
- ☑ **Warrant C: Transition to Signal Control or Transition to Yield Control at a Circular Intersection.** All-Way Stop control may be installed as an interim measure to control traffic before the installation of a traffic signal or before the installation of yield control at a roundabout.
- ☑ **Warrant D: 8-Hour Volume (Vehicles, Pedestrians, Bicycles).** All-Way Stop control may be installed at an intersection where an engineering study indicates that the combined motor vehicle, bicycle, and pedestrian volume entering the intersection from the major street approaches is at least 300 units per hour for each of any 8 hours of a typical day; and the combined motor vehicle, bicycle, and pedestrian volume entering the intersection from the minor street approaches is at least 200 units per hour for each of any of the same 8 hours.
    - If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants may be reduced to 70 percent of these values.
- ☑ **Warrant E: Other Factors.** All-Way Stop control may be installed at an intersection where an engineering study indicates that All-Way Stop control is needed due to other factors not addressed in the other All-Way Stop Control warrants. Such other factors may include, but are not limited to, the following:
    - The need to control left-turn conflicts,
    - An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where All-Way Stop control would improve traffic operational characteristics of the intersection, or
    - Where pedestrian and/or bicyclist movements support the installation of All-Way Stop control.

New Signs

There are a number of new signs proposed in this version. Some of the signs that can have more common applicability are shown below.

Bicycle Lane Use Control Signs. New Lane Use Control signs for roadways where bike lanes are used have been added. The signs show the bike lane in black background in addition to the vehicular lane use portion.

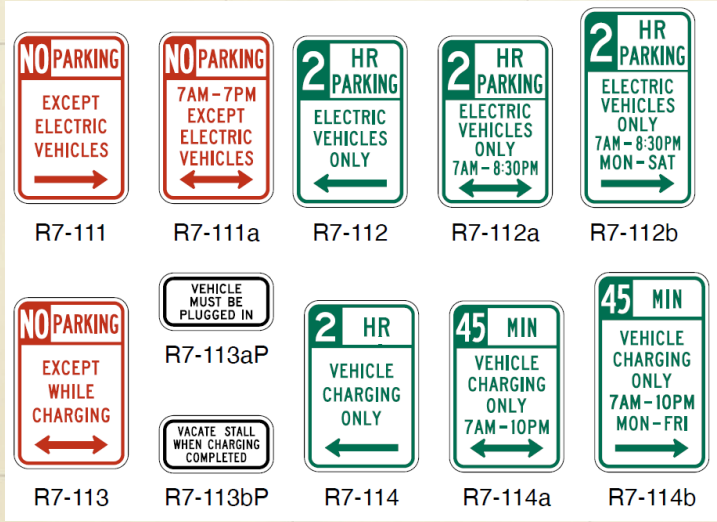
R3-8xa Sign

Exclusion Signs. Signs for No Thru Trucks and No Thru Traffic are added.

R5-2b and R5-12 Signs

Electric Vehicle Parking and Charging Signs and Plaques. New signs are included which allow exclusive use for electric vehicle parking and charging. These signs can be used similarly to No Parking or signs restricting parking and can be used for roadside parking restrictions or within parking lots.

R7 Series Signing



Left Turn Yield to Bicycles. This sign can be used where a conflicting bicyclist movement would be unexpected.

R10-12b Sign

Crosswalk – Stop on Red. These signs are for use in conjunction with pedestrian hybrid beacons. The STOP ON STEADY RED - YIELD ON FLASHING RED AFTER STOP is new to the MUTCD.

R10-23 and R10-23a Signs

Stop on Flashing Red. These are signs for use with emergency vehicle hybrid beacons. The STOP HERE ON FLASHING RED sign is new to the MUTCD and may be installed if extra emphases is needed.

R10-14, R10-14a, and R10-14b Signs

Hand-Held Cell Phone Restrictions. Signs have been added to indicate restrictions for hand-held phone use by the driver of a vehicle if prohibited by law. Previously, TEA had a recommended design in the DoD Supplement to the MUTCD, but this version takes precedence. The MUTCD allows the word legend of this sign be adjusted to reflect the appropriate law if variations exist.

R16-15 and R16-15a Signs

Vehicle Speed Feedback Signs. These signs are now formalized in the MUTCD. The placard version of the sign (W13-20aP) can be used either mounted beneath a Speed Limit sign to reinforce the speed at which a driver is traveling compared to a regulatory speed; or the standalone version of the sign (W13-20) can be mounted alone when used to supplement a horizontal alignment warning speed sign. In this case, it is to be mounted near the point of curvature of a horizontal curve.

The Vehicle Speed Feedback sign and plaque shall not flash, strobe or use other dynamic elements integrated into the changeable legend display. When no vehicles are approaching, the changeable display shall not display a legend.

MUTCD Figure 2C-4. Vehicle Speed Feedback Sign and Plaque, W13-20 and W13-20aP

Narrow Underpass and One Lane Underpass. Signs to warn for a narrow underpass and for a one lane underpass are added. Narrow bridge signing has traditionally been available, but now these signs are available for similar needs for underpasses.

W5-2a and W5-3a Signs

No Traffic Signs. A new sign is now available for a low volume road to warn motorists that no signs are installed along the distance of the road.

W18-1 Sign

Lanes Merge Signs. A new design is available for merging lanes where both the left and right lanes must merge to the center in one lane. The W9-4 may be used in advance of the W4-8 to provide additional warning.

W4-8 Sign and W9-4 Signs

Changeable Message Signs

Changeable Message Signs (CMS), also known as variable message signs, have more defined limits regarding their use. Specifically, the intent is that they should only be used for a traffic-information related purpose and not for advertising or other messages not related to traffic control. Per the MUTCD: "*CMS shall display only traffic operational, regulatory, warning, and guidance information except as otherwise provided… State and local highway agencies that have permanently-installed or positioned CMS shall issue and maintain a policy regarding the use and display of all types of messages to be used on their CMS. The policy shall define the types of messages that will be allowed.*"

An exception to limiting the message to specific traffic control information is the permission to display Amber Alert information on CMS boards, or emergency

messages displayed in a state of emergency. In the case of emergencies, the message should undergo significant levels of scrutiny before being approved for broadcast to ensure accuracy and consistency with emergency conditions.

Another exception is the allowance for their use for traffic safety campaign information. If used in this manner, the message should be appropriately concise and relevant to the roadway on which the message could apply. For example, school bus safety messages should not be displayed on interstates since school bus stops do not occur on interstates. Examples of appropriate messages are: "UNBUCKLED SEAT BELTS FINE + POINTS" and "IMPAIRED DRIVERS LOSE LICENSE + JAIL."

Pavement Markings

Pavement markings have new requirements related to retroreflectivity and application in certain situations.

Marking Retroreflectivity. Pavement markings used on roadways with speed limits of 35 mph or greater require minimum retroreflectivity levels of 50 mcd/m^2/lx (millicandelas per square meter per lux). While not new with this version of the MUTCD, pavement marking retroreflectivity standards were previously included in an interim update to the 2009 MUTCD; therefore, this is the first version which incorporates the standards on initial release.

Pavement marking retroreflectivity standards generally apply to longitudinal markings. The following markings are excluded from the requirements:

- Markings where ambient illumination assures that the markings are adequately visible.
- Markings on streets or highways that have an ADT of less than 6,000 vehicles per day.
- Dotted extension lines that extend a longitudinal line through an intersection, major driveway, or interchange area.
- Curb markings.
- Parking space markings.
- Shared-use path markings.

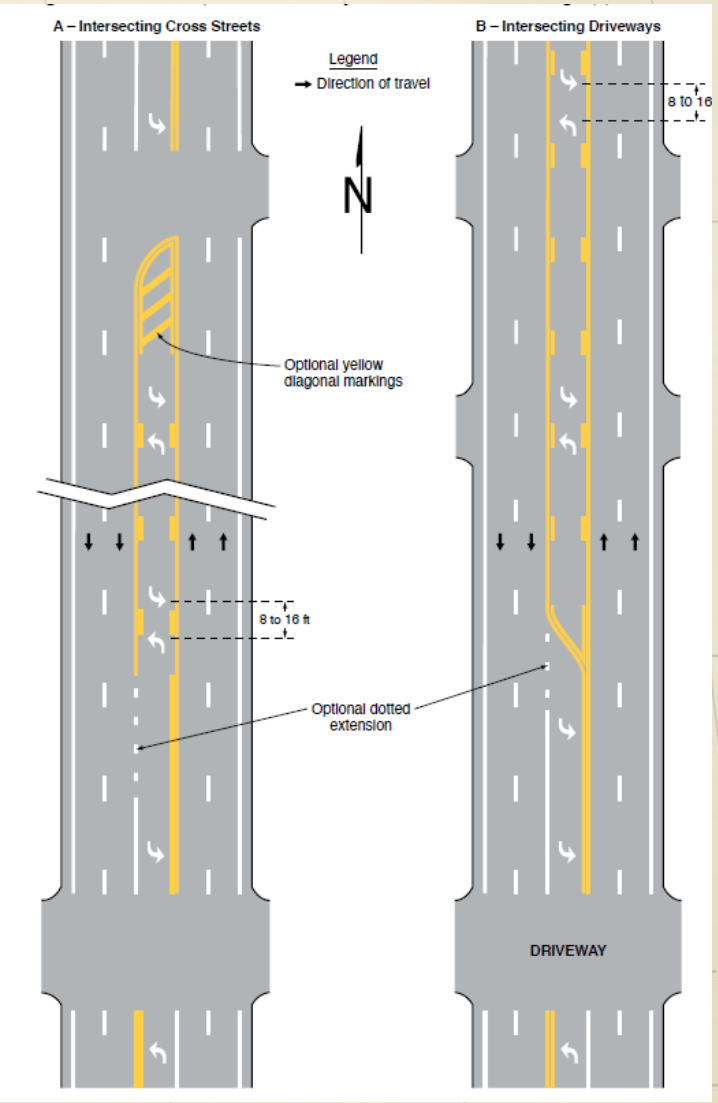
Non-longitudinal markings do not need to meet the retroreflectivity requirements. Examples of non-longitudinal markings include:

- Transverse markings, such as stop and yield lines.
- Word, symbol, and arrow markings.
- Crosswalk markings.
- Chevron, diagonal, and crosshatch markings.

Per guidance criteria in the manual, a method to maintain minimum retroreflectivity at or above 100 mcd/m^2/lx should be in place for longitudinal markings on roadways with speed limits of 70 mph and greater.

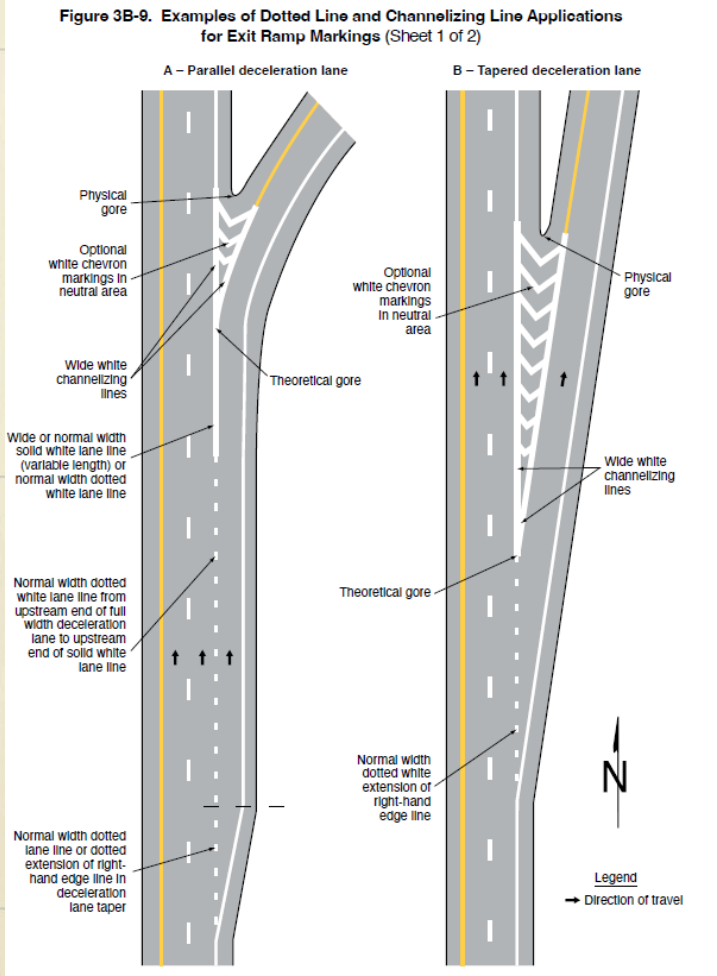
Marking Application. Application of pavement markings are generally the same as in the previous version of the MUTCD, suggesting that no major changes to practical application of markings are in place. There are minor changes, particularly the addition of an optional dotted extension line for transitioning between a two-way left-turn lane and an exclusive left-turn lane. Again, this option was previously included in an interim update to the 2009 MUTCD.

MUTCD Figure 3B-7. Examples of Two-Way Left-Turn Lane Marking Applications



Under the current MUTCD, there is a requirement for adding dotted white line extensions for deceleration lanes at exit ramps and acceleration lanes at entrance ramps, which was optional in the previous version. While not necessarily common on military installations, there are scenarios where this could be a factor.

MUTCD Figure 3B-9. Examples of Dotted Line Channelizing Line Applications for Exit Ramp Markings



Speed Humps. For locations where speed humps incorporate a crosswalk, generally occurring at raised crosswalks, crosswalk markings are now required.

Raised Pavement Markings. A new requirement regarding non-reflective raised pavement markings is that they must be used in conjunction with reflective or internally illuminated markers when used as a substitute for other types of pavement markings. They shall not be used alone due to the lack of retroreflectivity and lack of recognition for machine vision devices.

Crosswalks

New with this version of the MUTCD, crosswalk markings are required at legally established crosswalks at non-intersection locations. The intent is to aid pedestrian visibility at locations where pedestrian activity is not expected, and where visibility may be limited.

At uncontrolled approaches, an engineering study should be performed before a marked crosswalk is installed. The following criteria should be considered:

- ☑ Total number of approach lanes.
- ☑ The presence of a median.
- ☑ The distance from adjacent signalized intersections or other controlled crossings.
- ☑ Projected pedestrian and bicyclist volumes.
- ☑ Pedestrian and bicyclist paths of travel.
- ☑ Pedestrian ages and abilities.
- ☑ Pedestrian and bicyclist delays.
- ☑ Location or frequency of public transit stops.
- ☑ Average daily traffic (ADT).
- ☑ Speed limit or the 85th-percentile speed.
- ☑ The horizontal and vertical geometry of the crossing location.
- ☑ The possible consolidation of multiple crossing points.
- ☑ The availability of street lighting.
- ☑ Other appropriate factors.

The installation of other traffic control devices and 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 all be considered in addition to a new marked crosswalk and signs across an uncontrolled roadway where any of the following conditions exist:

- ☑ 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.
- ☑ 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.
- ☑ The posted speed limit is 40 mph or greater.

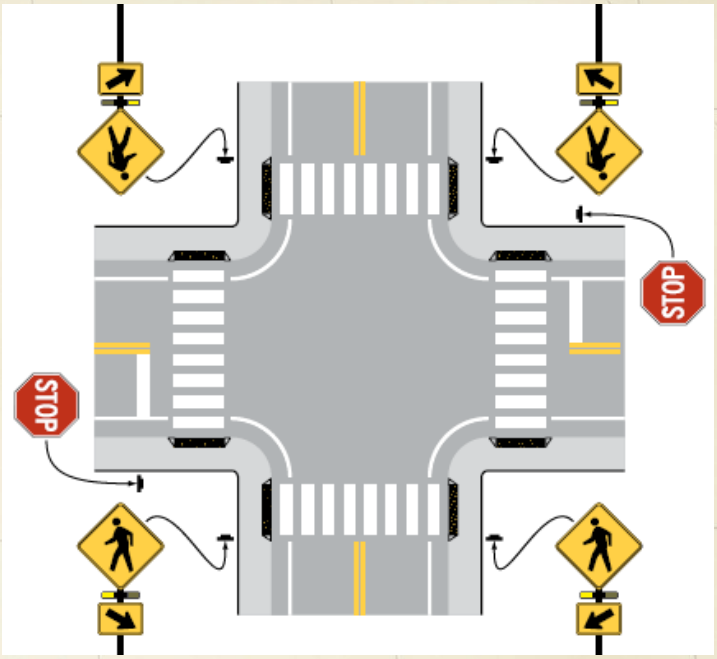
- ☑ A crash study reveals that multiple-threat crashes are the predominant crash type on a multi-lane approach.
- ☑ When adequate visibility cannot be provided by parking prohibitions.

Crosswalks markings must be white, at a minimum width of 6 feet. High visibility crosswalk markings should be installed at all non-intersection locations, along with warning signs and parking prohibitions on the approach for added visibility. A new bar pair high-visibility style of marking crosswalks is available as an option. All crosswalk marking options are shown in the figure at the bottom of the page.

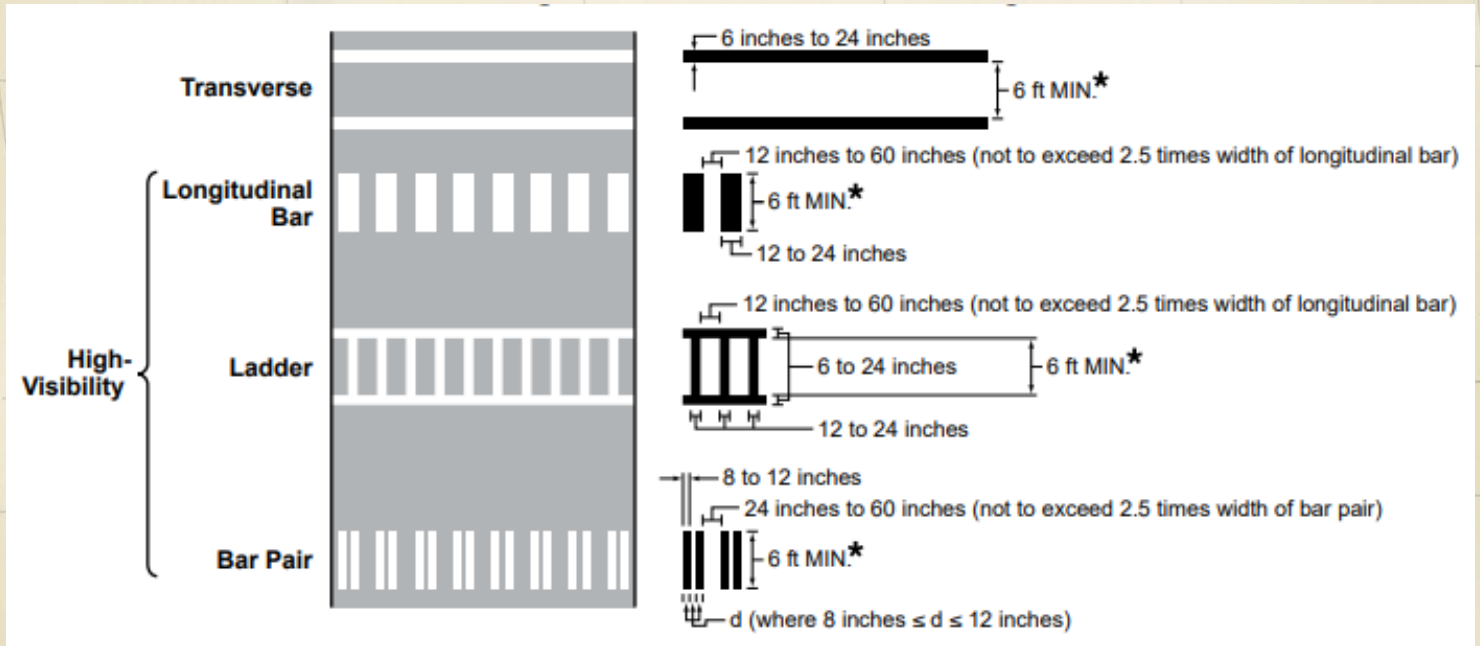
RRFBs

Rapid Rectangular Flashing Beacons (RRFBs) are now included in the MUTCD. They had previously been allowed through an interim approval, but now their use is formalized in the MUTCD. When used, they shall only be used to supplement a post-mounted or overhead-mounted W11-2 Pedestrian Crossing sign or S1-1 School Crossing sign, located immediately adjacent to a marked crosswalk. They may only be used at uncontrolled crosswalks and not used at approaches controlled by YIELD signs, STOP signs, traffic control signals, or pedestrian hybrid beacons; except at roundabouts and crosswalks spanning channelized turning lanes.

RRFBs may be used at intersections with more than one crosswalk on the same uncontrolled direction of travel. If used in this manner, one RRFB can suffice to be used at the first crosswalk that traffic encounters. When activated, the RRFBs on both approaches must flash simultaneously.



MUTCD Figure 3C-1. Crosswalk Markings



Traffic Signals

This version of the MUTCD has expanded the Crash Experience warrant for justifying a traffic signal by adding more detail regarding the frequency and number of crashes, duration of available crash data, as well as consideration for the number of through lanes and number of intersection legs (3 or 4).

This version of the MUTCD introduced a bicycle image for traffic signal indications. The bicycle image is intended to apply only to bicycle traffic, with the meaning of the indications being generally the same for bicycles compared to vehicular traffic signals. One exception is there is no flashing yellow indication for bicycles unless the signal is in emergency flash mode.

MUTCD Figure 4H-1. Typical Arrangements of Bicycle Signal Faces

If bicycle signals are used, they are only to be used to control bicycle movements from a dedicated bicycle lane or a separate facility such as a shared-use path. Bicycles must not be given a green or yellow indication when their movement is in conflict with any vehicular movements, including right turns on red.

Bicycle traffic signals may be used to provide a protected bicycle phase or a leading or lagging bicycle interval, and they can be used to provide an indication that may differ from the adjacent travel lane, particularly a turn lane with special phasing. They can also provide a bicycle interval for a counter-flow bicycle facility as well as unusual or complex situations for bicycle traffic through intersections. Another situation in which they can be used is at a mid-block signal where there are no vehicular movements parallel to the bicycle crossing.

Bicycle signal indications may be 4-inch, 8-inch, or 12-inch. The only use for 4-inch indications is a near-side supplemental signal face.

For vehicular signals, 12-inch signal indications are now required with some infrequent exceptions. The majority of the requirements to use 12-inch signals were not in the initial release of the 2009 MUTCD but were included in an update. A flashing yellow arrow is introduced for right-turn movements in this version and is used generally the same as the flashing yellow arrow for left-turn traffic.

As for vehicular signals, this version of the MUTCD prohibits circular green and yellow indications in cases where there is no through lane. Instances where there is no through lane occur at a 3-leg intersection, or at a 4-leg intersection where a one-way condition in the opposite direction ends at the intersection. Circular green and circular yellow signal indications shall not be displayed to an approach with no through movement if:

- ☑ The posted or statutory speed limit on the approach is 35 mph or higher,
- ☑ The one-way roadway that opposes the approach is an exit ramp from a freeway or expressway, or
- ☑ The one-way roadway that opposes the approach has a posted or statutory speed limit of 35 mph or higher.

Summary

Since its release, the 2023 version of the MUTCD is the enforceable standard which must be followed throughout the United States. With several changes versus the preceding edition, it is important to know the current requirements.

In addition to the national MUTCD, some states have a state supplement to the MUTCD or their own state MUTCD. If either of these apply, it is important to be aware of the requirements and know what specifically is required in each state.

TEA is always available as a resource for interpretation of MUTCD standards, and assistance with the application of standards. Feel free to reach out to our team at any time at: army.sddc.safb.traffic@mail.mil.

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for pamphlets, bulletins and studies

Reference List

- ☑ Manual on Uniform Traffic Control Devices (MUTCD) - FHWA (dot.gov)

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