### The 2011 MMUTCD

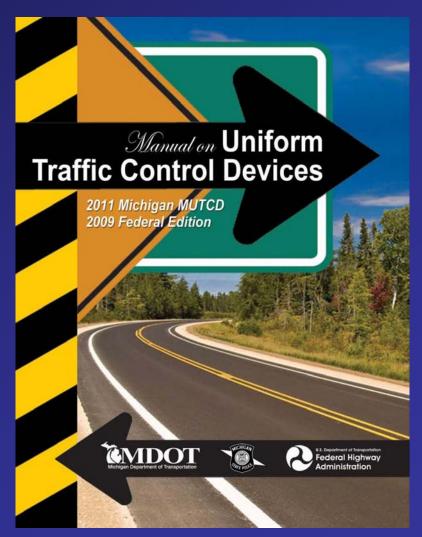
December 3, 2012





### MMUTCD Adoption Date

- For Michigan a new manual has to be in place by January 15, 2012
- Manual addresses:
  - Unique items in MVC
  - Unique items in Michigan
- Effective December 1, 2011





### Old Compliance Dates

- Compliance dates are for those "Big Ticket" items
- 67 Phase-in Target Compliance Dates for Devices, includes:
  - Dates established by previous final rules (3)
  - Dates established in 2005 MMUTCD (52)
  - New compliance items in 2011 MMUTCD (12)



### Items with No Specific Compliance Date

- New or reconstructed devices installed shall be in compliance with State MUTCD
- Federal-aid projects require devices to be in conformance to MUTCD
- Upgrade non-compliant devices as part of systematic upgrade



### Compliance Option

Replacement of damaged, missing, or no longer serviceable non-compliant device:

Option for agencies to establish policies:

replace with compliant device;

or

 replace in kind under some conditions

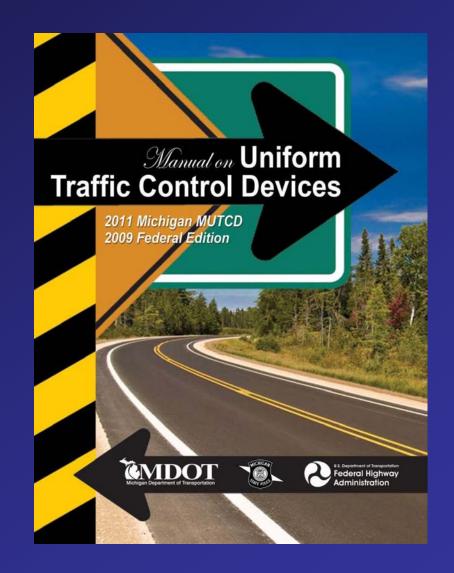




### New Compliance Dates

- Compliance dates are for those "Big Ticket" items
- 12 Phase-in Target Compliance Dates for Devices, includes:
  - Dates established by previous final rules (3)
  - Dates established in 2005 MMUTCD (1)
  - New compliance items in 2011 MMUTCD (8)

### Overall





### Paragraphs are numbered!

### Guidance statements are italicized

#### Section 4B.01 General

#### Support:

- Words such as pedestrians and bicyclis sensitivity to these elements of "traffic."
- of a variety of road users, including those fatigued or distracted, or who are not expe

#### Section 4B.02 Basis of Installation or

#### Guidance:

on The selection and use of traffic contro and other conditions.

#### Support:

A careful analysis of traffic operations of signalized and unsignalized locations, c warrants, described in Chapter 4C, that de signals might be justified.

#### Guidance:

03

Engineering judgment should be appli



### Metric values have been removed from the text, figures, and tables

 Only English units are used in the text, tables, and figures of the MMUTCD

New Appendix
A2 includes the
equivalent
metric values for
all English units
used in the
MMUTCD

2009 Edition

#### **APPENDIX A2**

#### METRIC CONVERSIONS

Throughout this Manual all dimensions and distances are provided in English units. Tables A2-1 th A2-4 show the equivalent Metric (International System of Units) value for each of the English unit num values that are used in this Manual.

Table A2-1. Conversion of Inches to Millimeters

Inches	Millimeters			
0.25	6			
0.4	10			
0.5	13			
0.75	19			
1	25			
1.25	31			
2	50			
2.25	56			
2.5	62			
3	75			

Inches	Millimeters		
3.5	87		
4	100		
4.5	113		
5	125		
6	150		
8	200		
9	225		
10	250		
10.4	260		
10.6	265		

Inches	Millimeters		
12	300		
15	375		
16	400		
18	450		
21	525		
24	600		
27	675		
28	700		
30	750		
32	800		

Inches	M
36	
42	
48	
54	
60	
72	
84	
120	

Note: 1 inch = 25.4 millimeters; 1 millimeter = 0.039 inches



### MMUTCD applies to private roads that are "open to public travel"



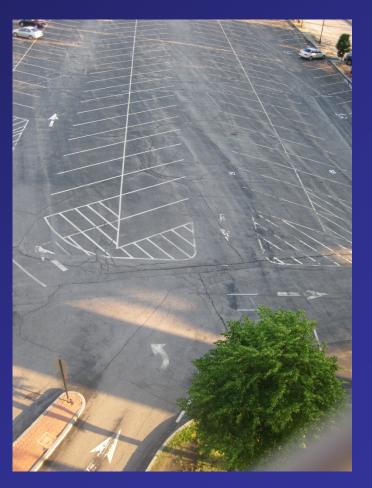
Toll roads and <u>roads</u> within shopping centers, airports, sports arenas, theme parks, and similar business or recreation facilities that are privately owned, but the public is allowed to travel without access restrictions

뼂

Parking areas and their driving aisles are not subject to the MMUTCD,

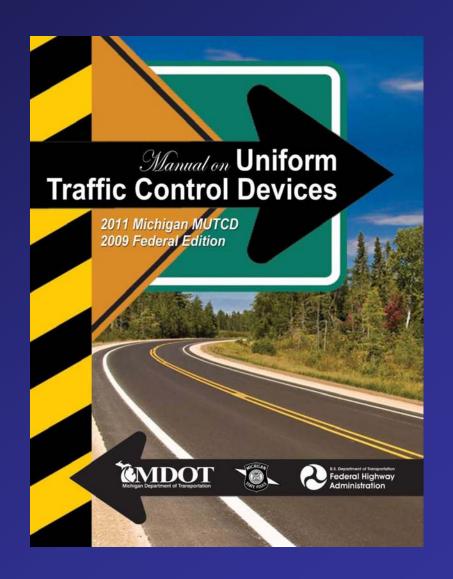
however





Part 1

General





# Certain signs and other devices are not considered to be traffic control devices

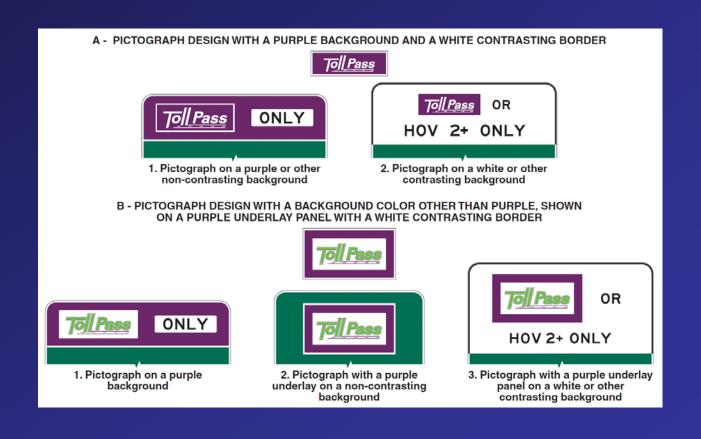






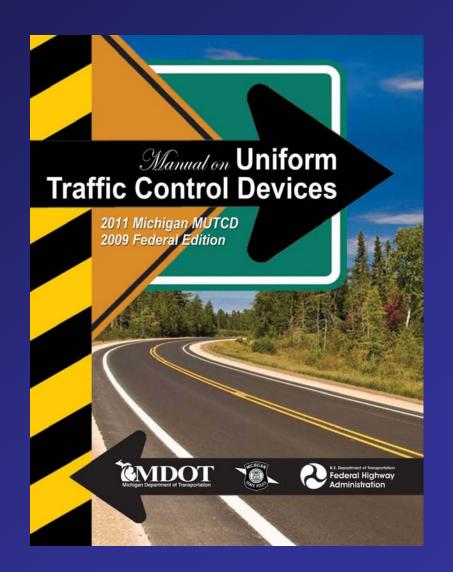


## New purple color for lanes restricted to only vehicles with registered "electronic toll collection accounts"



Part 2

Signs



#### $\equiv$

### New Chapters and Revisions for Part 2

- Relocation of gates and barricades to Chapter 2B
- Relocation of object markers from Part 3 to Chapter 2C
- New Chapter 2F Toll Road Signs
- New Chapter 2G Preferential and Managed Lanes
- New Chapter 2H General Information Signs
- New Chapter 2I General Service Signs
- New Chapter 2L Changeable Message Signs



### New Sign Retroreflectivity Compliance Dates

2014

June 13, Identify and begin using method(s) for regulatory and warning signs

Other signs are to be added to agency's method as resources allow.



### Maintaining Minimum Retroreflectivity

#### "Standard:

Public agencies or officials having jurisdiction shall use an assessment or management method that is designed to maintain sign retroreflectivity at or above the minimum levels in Table 2A-3"



### Maintaining Minimum Retroreflectivity

All signs identified by an agency's method as being below minimum values need to be replaced.

Replacement should be based on agency's resources and relative priorities.



### MUTCD Table 2A-3

		Sheeting Type (ASTM D4956)				
Sign Color	Criteria	Beaded			Prismatic	
		_	=	Ш	III, IV, VI, VII, VIII, IX, X	
White on Red	CR ≥3	35 / 7				
Black on Orange or Yellow	Bold or Text ≥48"	X	50			
	Fine or Text <48"	X	75			
Black on White	1	50				
White on Green	Overhead	x / 7	x / 15	x / 25	250 / 25	
	Shoulder	x / 7	120 / 15			



### Sign Maintenance Methods

- Visual Nighttime Inspection
- Measured Sign Retroreflectivity
- Expected Sign Life
- Blanket replacement
- Control signs
- Any combination of above
- Other methods based on engineering studies



### Lateral Offset

 Sign supports within the clear zone for roads with posted speed limit of 50 mph or higher shall be crashworthy (NCHRP Report 350) unless shielded with a longitudinal barrier or crash cushion

Compliance date of August 15, 2015



### Many New Symbols























### Lettering for Place Names and Destinations

- Mixed-case lettering required for names of places, streets, and highways for guide signs
- Mixed-case lettering consists of an initial uppercase letter followed by lower-case letters
- Letter height is specified as the height of the initial upper-case letter









# New Options for Sign Conspicuity Enhancement









### Larger Sizes for STOP signs

- 36 inches for any STOP sign facing a multi-lane approach
- 36 inches for any multi-lane side road approach to a multi-lane road
- 36 inches for any side road approach to a multi-lane road with a speed limit of 45 mph or higher





The use of 2-WAY, 3-WAY, and 4-WAY plaques is prohibited

ALL-WAY plaque remains as a "shall" if STOP signs are used on all approaches





Signs mounted backto-back with STOP or YIELD signs should stay within the edges



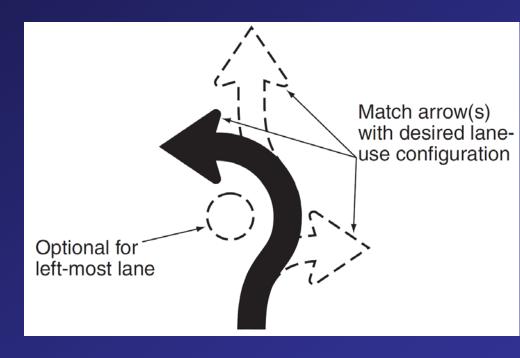








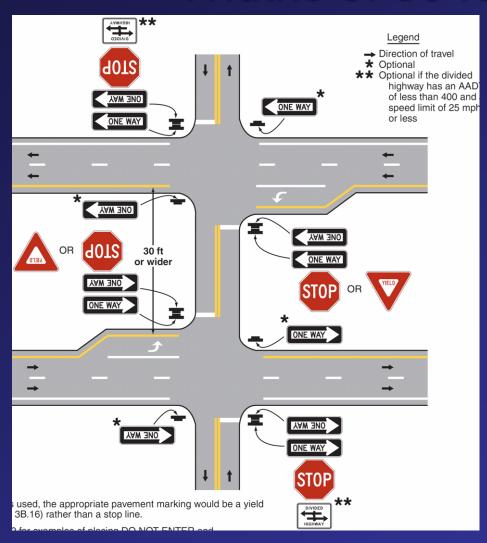
### New optional fish-hook arrows for use on lane-use control signs at roundabouts







### Divided Highways with Median Widths of 30 feet or More



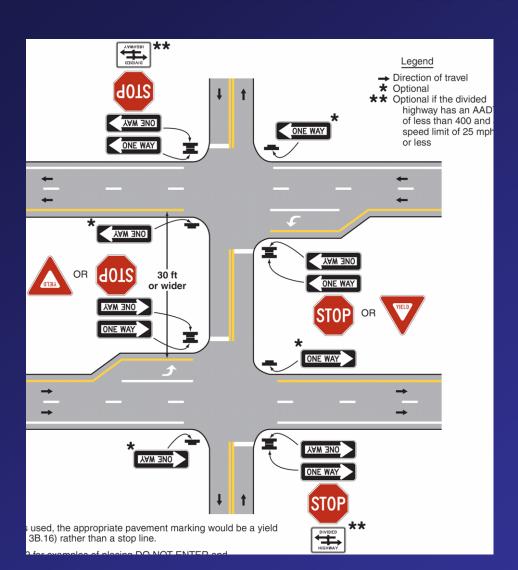
One-Way signs on near right and far left corners are required rather than recommended

Far right One-Way signs are optional

Compliance date of December 31, 2019 for this and next 4 slides



### Divided Highways with Median Widths of 30 feet or More

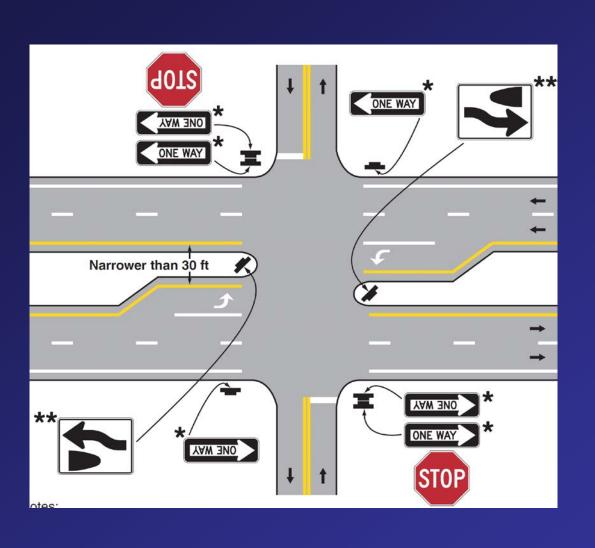


One-Way signs on near right and far left corners are required rather than recommended

Far right One-Way signs are optional



### Divided Highways with Median Widths of Less than 30 feet



#### Either:

One-Way signs on near right and far left corners (far right One-Way signs are optional)

<u>or</u>

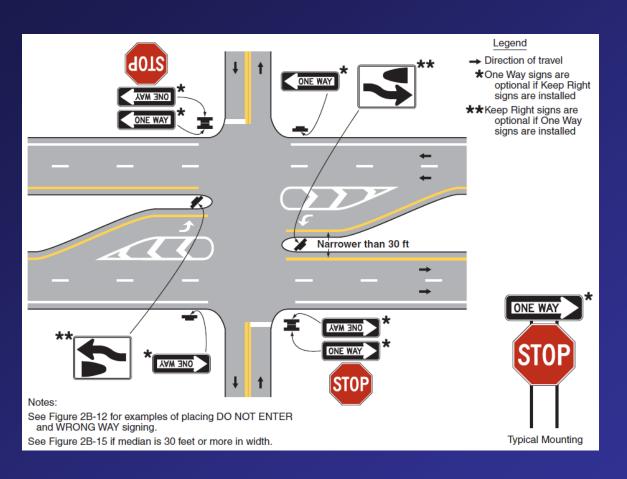
Keep Right signs in median noses

#### Legend

- → Direction of travel
- ★One Way signs are optional if Keep Right signs are installed
- ★★Keep Right signs are optional if One Way signs are installed



### Divided Highways with Median Widths of Less than 30 feet and Separated Left-turn Lanes



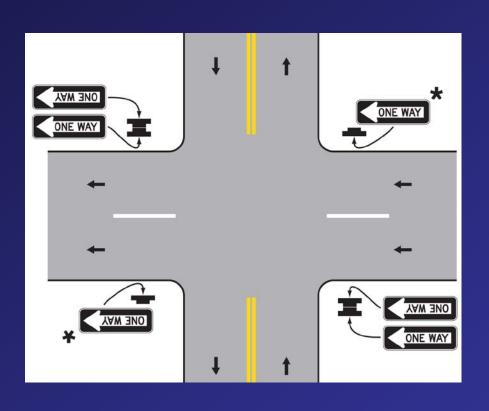
### Either:

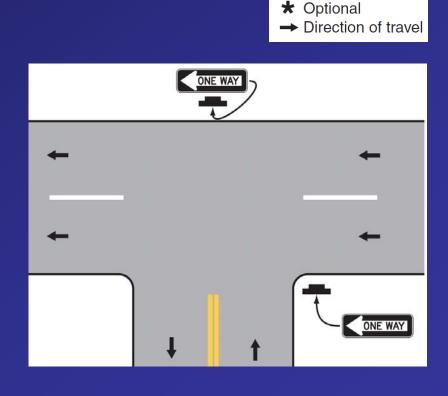
One-Way signs on near right and far left corners (far right One-Way signs are optional)

Keep Right signs in Median noses



# Near Side and Far Side One-Way Signs Required on the Minor-Street Approaches at 4-way and T-intersections





Legend

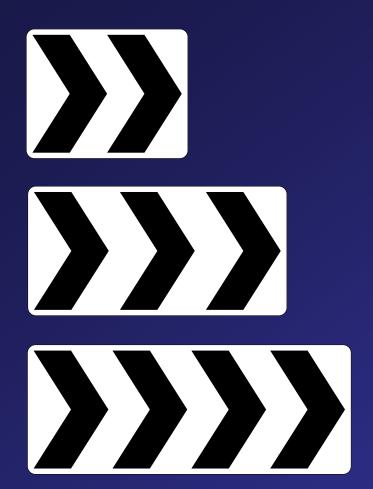


# Option for lower mounting height for Do Not Enter and Wrong Way signs on ramps



Minimum of 3 feet





Roundabout Directional
Arrow signs
(on central island)

# New Regulatory Signs for Use at Roundabouts



Roundabout Circulation sign (with YIELD sign at mini-roundabouts)





# New Pay for Parking and Parking Pay Station signs























# New Symbolic Design for the R10-15 sign



### Barricades and Gates

- Barricades Standards and Guidance relocated from Part 3
- Colors of barricades for non-TTC use shall be retroreflective white and red
- New section on Gates for all traffic uses
- Red/white stripes on gates shall be vertical rather than diagonal





## Some word message signs are deleted



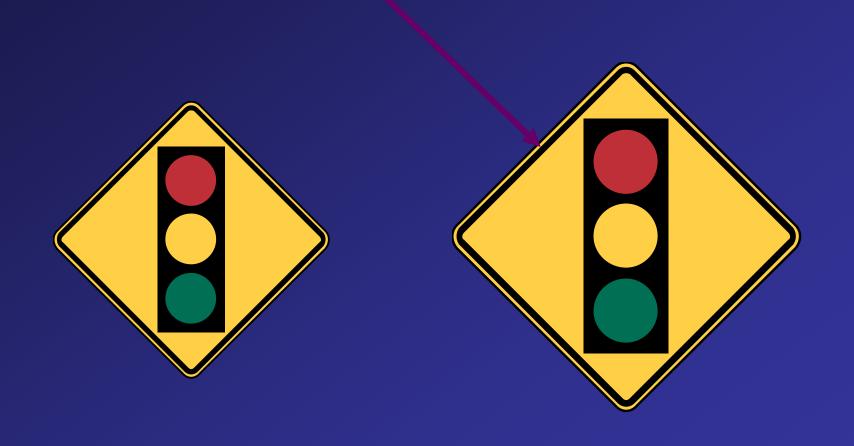




Also - STOP AHEAD, YIELD AHEAD, SIGNAL AHEAD



# 36" x 36" Minimum Size for Multi-lane Conventional Roads





### Fluorescent Yellow-Green Color

Required for school and school bus signs



Optional for pedestrian, bike, and playground signs









## Horizontal Alignment Warning Signs

#### Table 2C-5. Horizontal Alignment Sign Selection

Type of Horizontal Alignment Sign	Difference Between Speed Limit and Advisory Speed				
	5 mph	10 mph	15 mph	20 mph	25 mph or more
Turn (W1-1), Curve (W1-2), Reverse Turn (W1-3), Reverse Curve (W1-4), Winding Road (W1-5), and Combination Horizontal Alignment/Intersection (W10-1) (see Section 2C.07 to determine which sign to use)	Recommended	Required	Required	Required	Required
Advisory Speed Plaque (W13-1P)	Recommended	Required	Required	Required	Required
Chevrons (W1-8) and/or One Direction Large Arrow (W1-6)	Optional	Recommended	Required	Required	Required
Exit Speed (W13-2) and Ramp Speed (W13-3) on exit ramp	Optional	Optional	Recommended	Required	Required

Freeways, expressways, and functionally classified arterials and collectors over 1,000 AADT

## New Criteria for the Determination of Advisory Speeds

Support: Among the established engineering practices that are appropriate for the determination of the recommended advisory speed for a horizontal curve are the following:

- A. An accelerometer that provides a direct determination of side friction factors
- B. A design speed equation
- C. A traditional ball-bank indicator using the following criteria:
  - 16 degrees of ball-bank for speeds of 20 mph or less
  - 14 degrees of ball-bank for speeds of 25 to 30 mph
  - 12 degrees of ball-bank for speeds of 35 mph and higher



## Chevron Signs Spacing Table

Advisory Speed (mph)	Curve Radius (feet)	Sign Spacing (feet)	
15 or less	Less than 200	40	
20 to 30	200 to 400	80	
35 to 45	401 to 700	120	
50 to 60	701 to 1,250	160	
More than 60	More than 1,250	200	



# Speed Limit Reductions of more than 10 mph

Reduced Speed Limit
Ahead sign
recommended





# New Pedestrian/Bicycle Crossing Sign



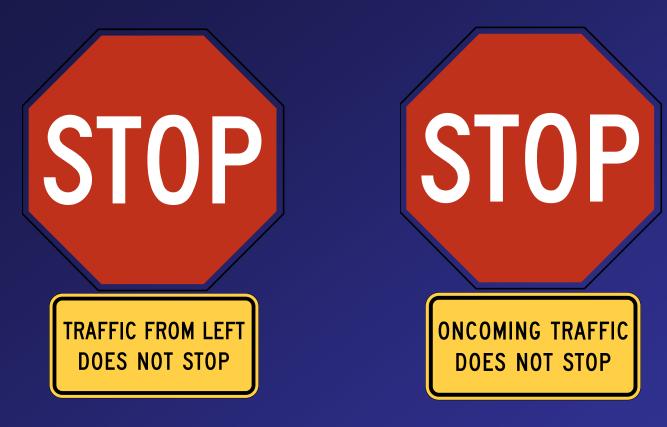




# New Symbol Signs to Warn of Possible Presence of Large Animals







Plaques for use when STOP signs control all but one approach to the intersection



Share the Road plaque cannot be used alone; can ONLY be used to supplement another sign





## Object Markers for Approach Ends of Guardrails

 Where Type 3 object markers are applied to the approach ends of guardrail and other roadside appurtenances, sheeting without a substrate shall be directly affixed to the approach end of the guardrail in a rectangular shape conforming to the size of the approach end of the guardrail, with alternating black and retroreflective yellow stripes sloping downward at a angle of 45 degrees toward the side of the obstruction on which traffic is to pass.









## Option to use all uppercase letters for place names and street names is deleted







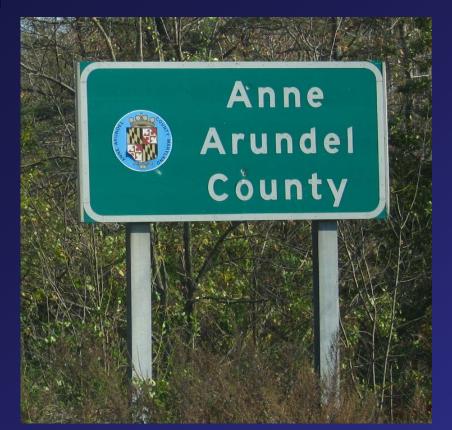
## Guide Signs should have no more than 3 lines of Destination Info



Lamar 15 Eads 51 Limon 133

Levitt Pkwy
Willingboro
Rancocas
NEXT RIGHT





# Provisions for use of Pictographs on Guide Signs

Exceeds maximum size, not official seal

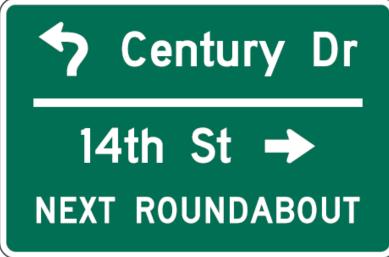


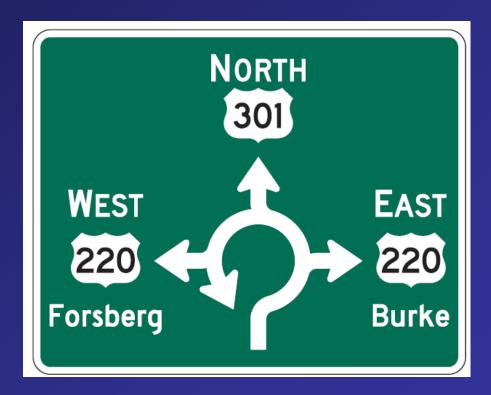




## New Guide Signs for Circular Intersections







Front Ave 🗷







## Cambridge st

E 8th St

Only alternatives to green
Street Name sign background color
are blue, brown, or white\*

\* White background with black legend only



## LEFT plaques required for numbered and non-numbered exits to the left



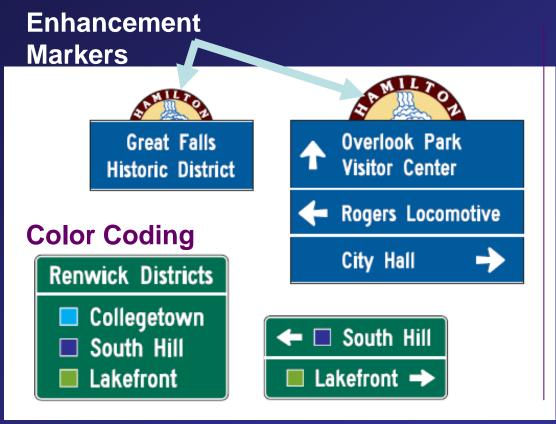
Plaques for Left-Hand Exits



Compliance date of December 31, 2014



# Community Wayfinding Guide Signs

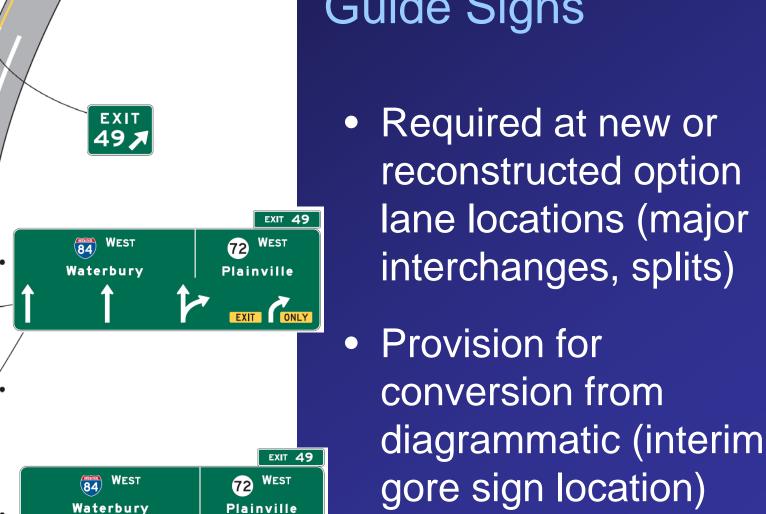


- Use on freeways, expressways, ramps not allowed
- Not for primary destinations
- Position of arrows, order and number of destinations
- Guidance on location of ped wayfinding



Overhead Arrow-per-Lane

Guide Signs



MILE



# Provisions for Changeable Message Signs

- Legend height
- Color
- Phases per cycle
- Display time







# Memorial or Dedication Signing

John D Basilone MEMORIAL BRIDGE

Gov Alfred E Driscoll

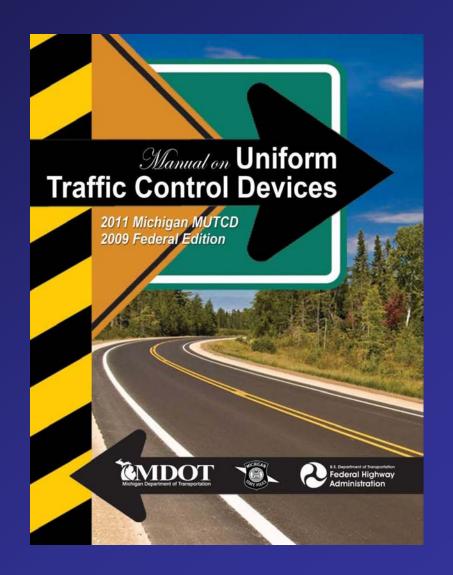
- One sign per direction
- No extraneous information or decorative elements





Part 3

Markings





### Colors

- Purple Markings only as optional supplement to lane lines or edge lines of toll plaza approach lanes that are restricted to vehicles with registered ETC accounts
- Blue RPMs Not a TCD
  - Removed from MUTCD, except for new Section 3B.11 Support statement describing their use by emergency personnel in locating fire hydrants





### Centerlines

A single yellow center line marking on a twoway roadway is specifically prohibited



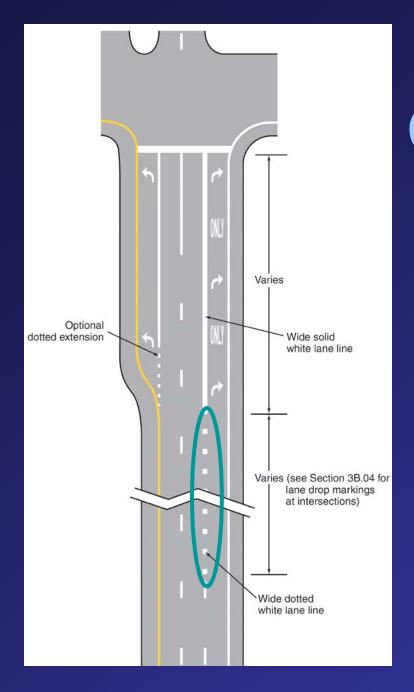
#### ■

### White Lane Line Markings

<u>Dotted</u> (not broken) lane lines shall be used for <u>non-continuing</u> lanes:

- Lane drops (wide dotted)
- Auxiliary lanes (wide dotted)
- Acceleration lanes (normal width dotted)
- Deceleration lanes (normal width dotted)

Applies on freeways, expressways, and conventional roads

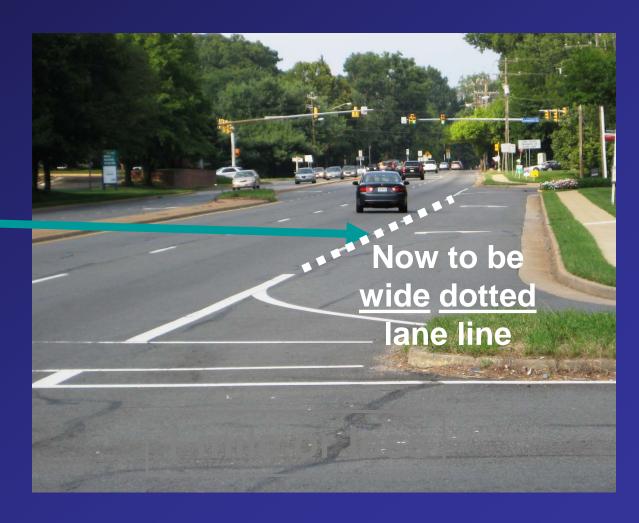


## Lane Drops on Conventional Roads



## 1 mile Optional dotted extension solid white lane line Wide dotted lane line

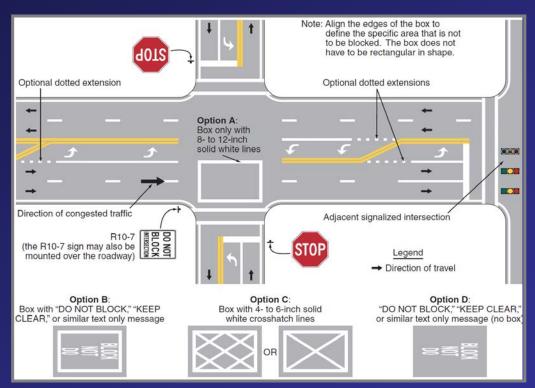
# Auxiliary Lanes between Intersections











# Do Not Block Intersection Pavement Markings



## Revised Guidance for Provision of Marked Crosswalks

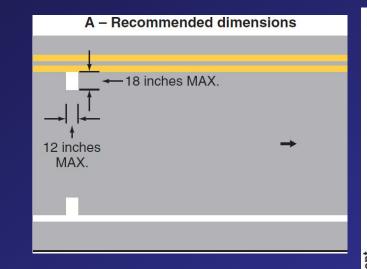
New marked crosswalks <u>alone</u>, <u>without other substantial</u> <u>measures</u> to reduce speeds, shorten crossing distance, enhance driver awareness of crossing, and/or provide active warning of ped presence <u>should not</u> be installed across uncontrolled roadways with:



- ≥ 4 travel lanes,
- Speed limit > 40 mph, and
- ADT > 12,000 without raised median or ped refuge, or > 15,000 with raised median or ped refuge



# Speed Reduction Markings added as an Option



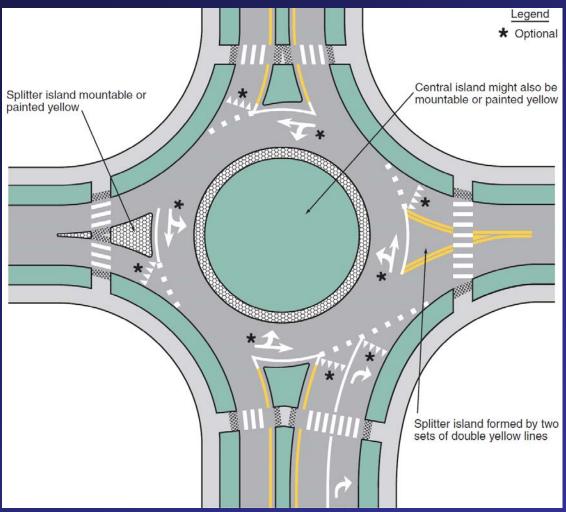




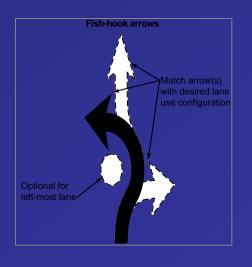
B - Example of placement



## Pavement Markings at Roundabouts



Includes optional fish-hook lane-use arrows for approaches to roundabouts





## Delineator Application







Delineators should be used with guardrails and other barriers



# Delineators on the left-hand side of a two-way roadway shall be white

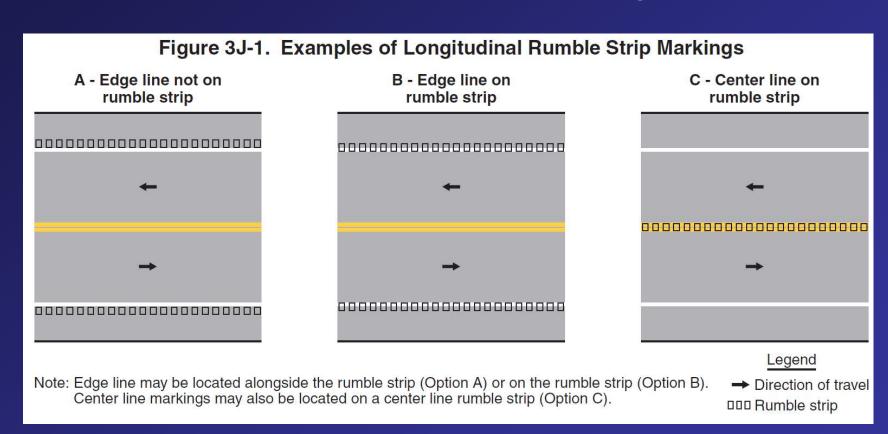


Shall match color of edge line



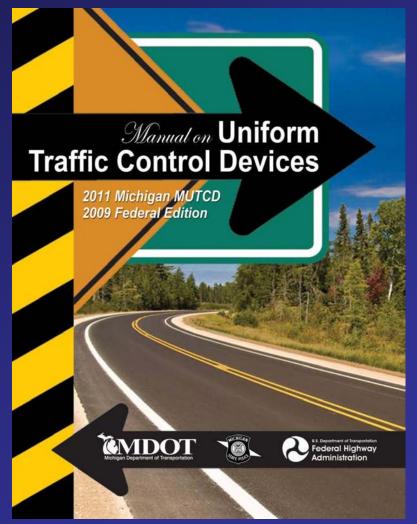
#### Rumble Stripes

An edge line shall not be used in addition to a rumble stripe that is located along a shoulder



Part 4

Highway Traffic Signals



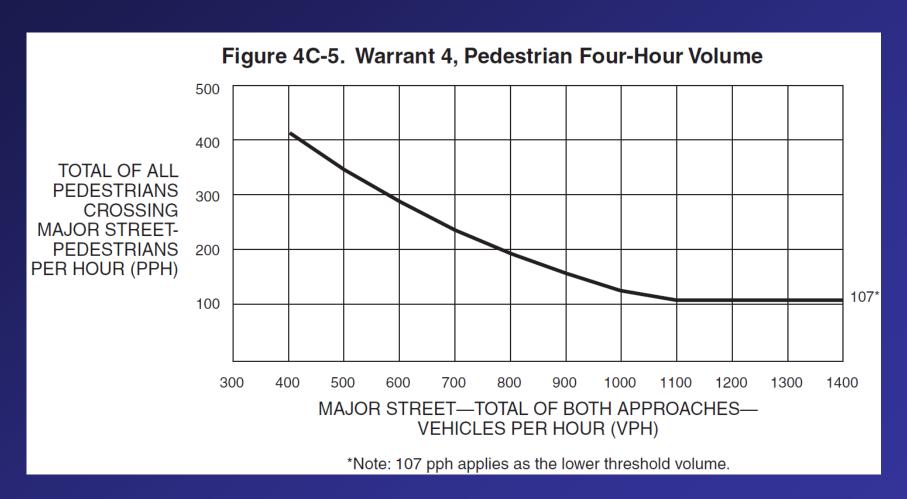


### New Guidance in Warrant 3 (Peak Hour)

- Signals installed under Warrant 3 (peak hour):
  - should be traffic-actuated, and
  - may be operated in flashing mode during off-peak hours



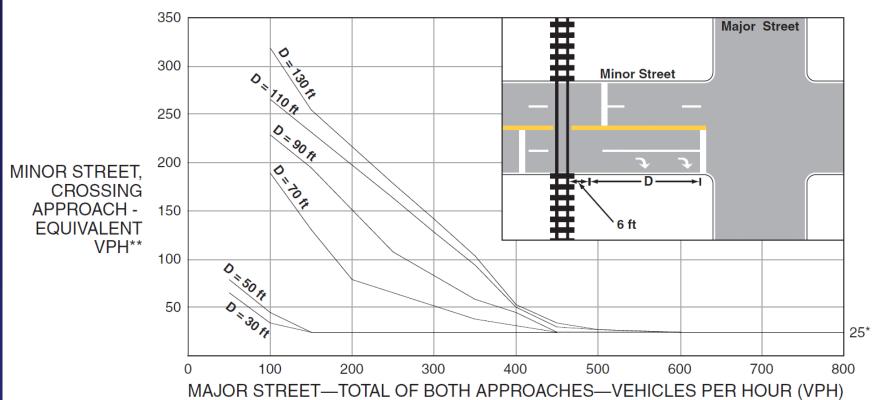
### Revisions to Warrant 4 (Pedestrian Volume)





### New Warrant 9 for Intersections near Grade Crossings

Figure 4C-10. Warrant 9, Intersection Near a Grade Crossing (Two or More Approach Lanes at the Track Crossing)

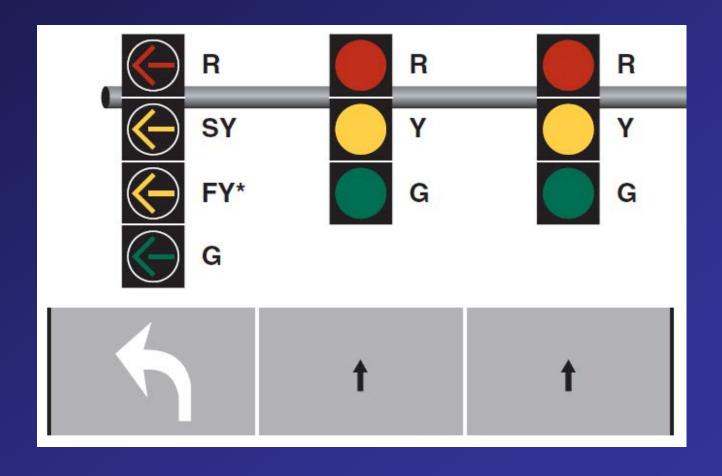


<sup>\* 25</sup> vph applies as the lower threshold volume

<sup>\*\*</sup> VPH after applying the adjustment factors in Tables 4C-2, 4C-3, and/or 4C-4, if appropriate

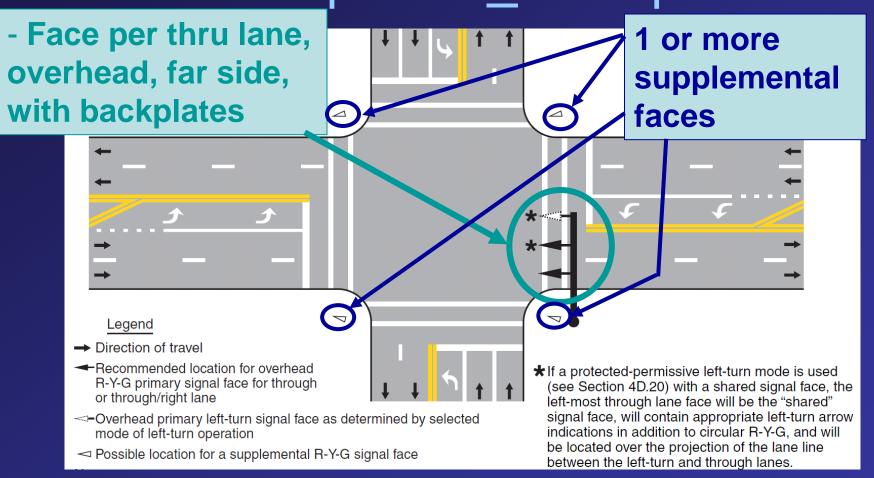


#### Flashing Yellow Arrow for Permissive Turns





## Recommended number, location, and design of signal faces for approaches with speeds > 45 mph:



#### $\equiv$

# Recommended minimum number of thru signal faces on approaches with speeds $\geq$ 45 mph:

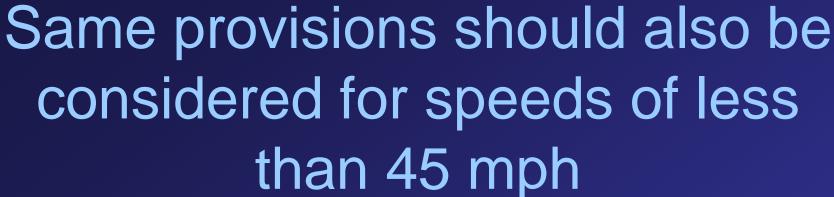
Table 4D-1. Recommended Minimum Number of Primary Signal Faces for Through Traffic on Approaches with Posted, Statutory, or 85<sup>th</sup>-Percentile Speed of 45 mph or Higher

Number of Through Lanes on Approach	Total Number of Primary Through Signal Faces for Approach*	Minimum Number of Overhead-Mounted Primary Through Signal Faces for Approach	
1	2	1	
2	2	1	
3	3	2**	
4 or more	4 or more	3**	

NOTES:

<sup>\*</sup>A minimum of two through signal faces is always required (See Section 4D.11). These recommended numbers of through signal faces may be exceeded. Also, see cone of vision requirements otherwise indicated in Section 4D.13.

<sup>\*\*</sup> If practical, all of the recommended number of primary through signal faces should be located overhead.







# Protected-only mode left-turn faces must use red arrow, not circular red

 Applies to left-turn signals but not to rightturn signals





### Yellow Change Intervals and Red Clearance Intervals

- Durations shall be determined using engineering practices
- Use of red clearance changed from option to guidance, when indicated by application of engineering practices

Compliance date of December 31, 2014 when timing adjustments are made to the individual intersection and/or corridor, whichever occurs first



# Back-up power should be provided for signals with RR preemption

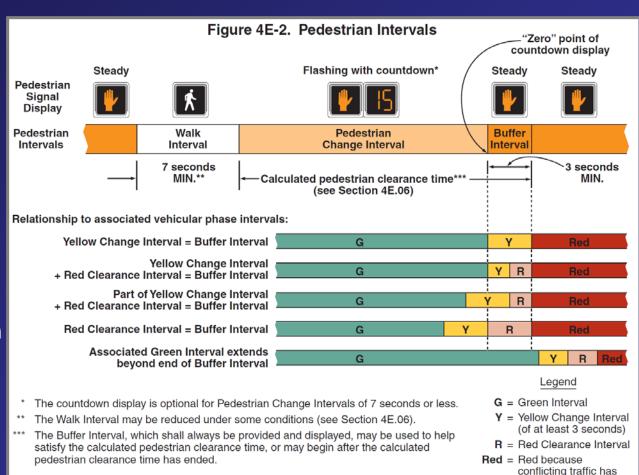




#### Pedestrian Clearance Time

Ped Change Interval (flashing DW):
- shall not extend into the red clearance interval - shall be followed by min. 3 sec. buffer interval

Compliance date of December 31, 2014 when timing adjustments are made to the individual intersection and/or corridor, whichever occurs first



been released



# Slower walking speed for calculating pedestrian clearance time (Guidance)

4.0 feet per second

Ped. Clearance Time based on 3.5 feet / sec

[Exception allows 4.0 ft /sec if extended button press or passive ped detection allows slower peds to request additional crossing time]

Sum of Walk time + Ped. Clearance Time based on 3.0 feet per second for distance from ped detector to far side



#### Countdown Pedestrian Displays

Required for all ped signals unless ped change interval is 7 seconds or less

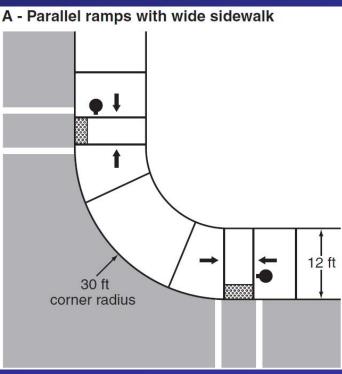
No specific compliance date for retrofitting existing ped signals (can remain w/o countdown until ped heads replaced)





## New guidance and figures for locations of pedestrian pushbuttons for a variety of conditions







Positioning of pedestrian pushbuttons and legends on pushbutton signs shall clearly indicate which crosswalk signal is activated by which pushbutton



#### HAWK

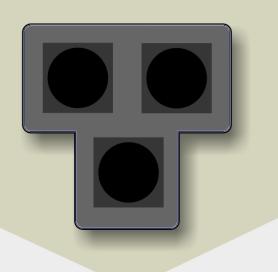
### High-intensity Activated crossWalK

- Mid-block crossing
- Protected pedestrian crossing



#### **Drivers**

see this:



Proceed through Intersection

#### **Pedestrians**

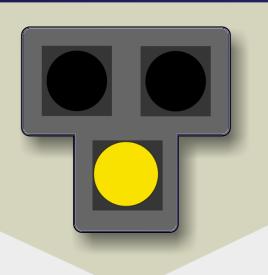
see this:



Push the Button to Cross

#### **Drivers**

see this:



#### **Slow Down**

(Pedestrian has activated the push button)

#### **Pedestrians**

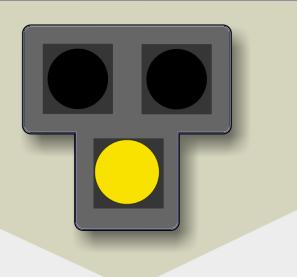
see this:



Wait

#### **Drivers**

see this:



**Prepare to Stop** 

#### **Pedestrians**

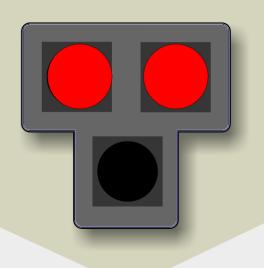
see this:



**Continue to Wait** 

#### **Drivers**

see this:



STOP!

(Pedestrian in Crosswalk)

#### **Pedestrians**

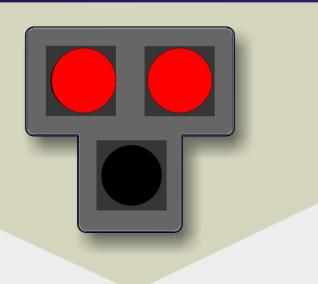
see this:



**Start Crossing** 

#### **Drivers**

see this:



**Proceed if Clear** 

#### **Pedestrians**

see this:

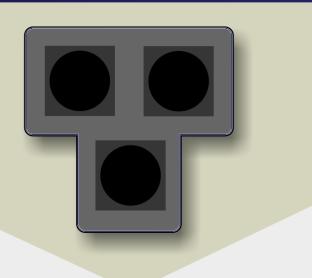


**Countdown Signal** 

(Continue Crossing)

#### **Drivers**

see this:



**Continue Driving** 

#### **Pedestrians**

see this:



STOP!

**Push the Button to Cross** 



### Intersection Control Beacons using Two Red Lenses

Horizontally aligned – flash simultaneously

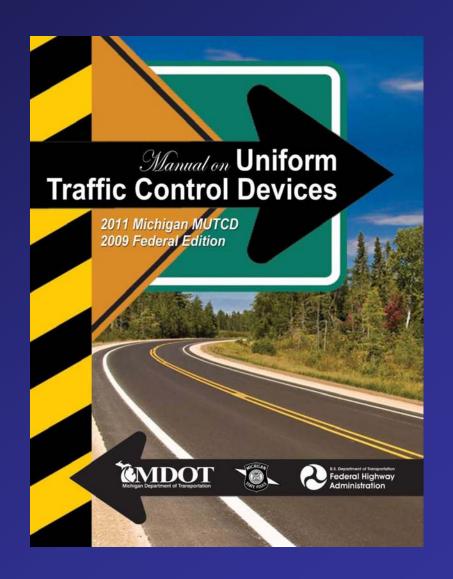




Vertically aligned – flash alternately

Part 5

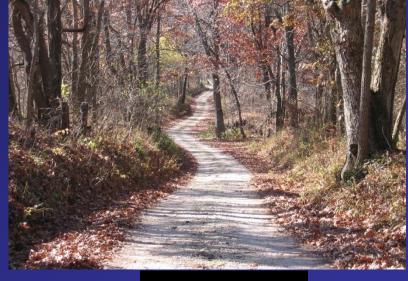
Low-Volume Roads





### Part 5 is not Applicable on Neighborhood Residential Streets





Not applicable

**Applicable** 

Part 5 applies only outside of built-up areas of cities, towns, and communities



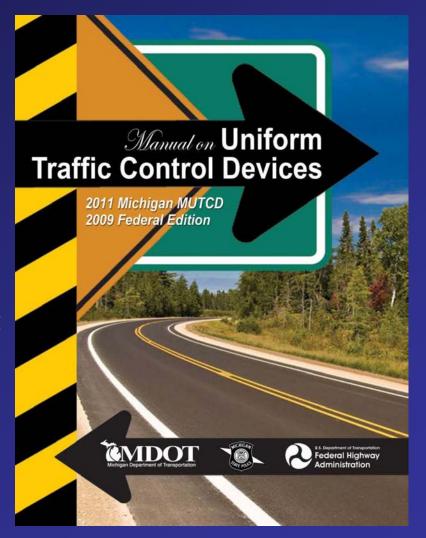
### Typical sizes for signs and plaques on low-volume roads are the same sizes as for conventional roads

Table 5A-1. Sign and Plaque Sizes on Low-Volume Roads (Sheet 1 of 2)

Sign or Plaque	Sign Designation	Section	Sign Sizes		
			Typical	Minimum	Oversized
Stop	R1-1	5B.02	30 x 30	_	36 x 36
Yield	R1-2	5B.02	30 x 30 x 30	_	36 x 36 x 36
Speed Limit (English)	R2-1	5B.03	24 x 30	18 x 24	36 x 48
Do Not Pass	R4-1	5B.04	24 x 30	_	36 x 48
Pass With Care	R4-2	5B.04	24 x 30	18 x 24	36 x 48
Keep Right	R4-7	5B.04	24 x 30	18 x 24	36 x 48

#### Part 6

### Temporary Traffic Control





# Minimum length for one-lane, two-way traffic taper added to Table 6C-3

Type of Taper	Taper Length		
Merging Taper	at least L		
Shifting Taper	at least 0.5 L		
Shoulder Taper	at least 0.33 L		
One-Lane, Two-Way Traffic Taper	50 feet minimum 100 feet maximum		
Downstream Taper	100 feet per lane		



#### High-Visibility Safety Apparel



Required for all workers within the public right of way

Applies to all roads, not just those on the Federal-aid system

Option for law enforcement and first responders to use new ANSI "public safety vests"

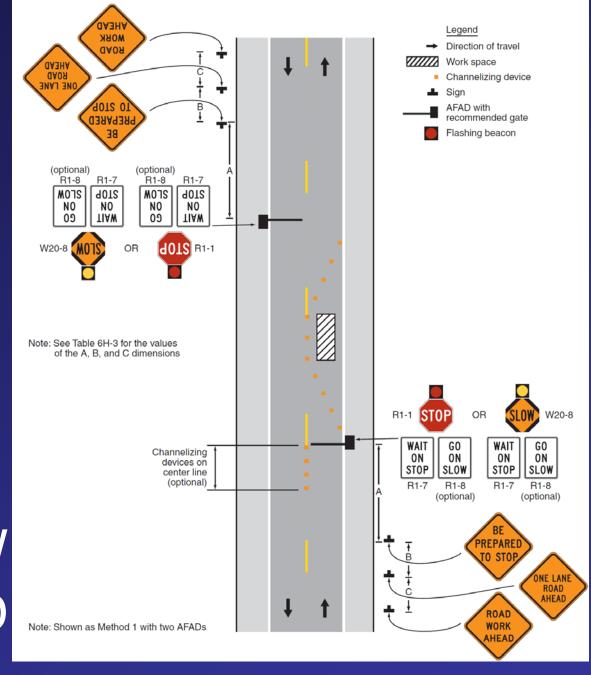
Firefighters and law enforcement are exempted from the requirement under certain conditions

Compliance date of December 31, 2011

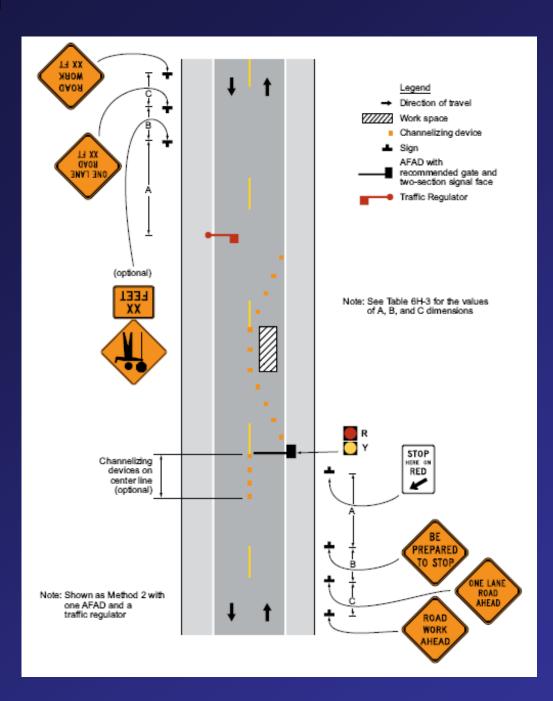


# Automated Flagger Assistance Device (AFAD)

Type 1: STOP/SLOW paddle AFAD





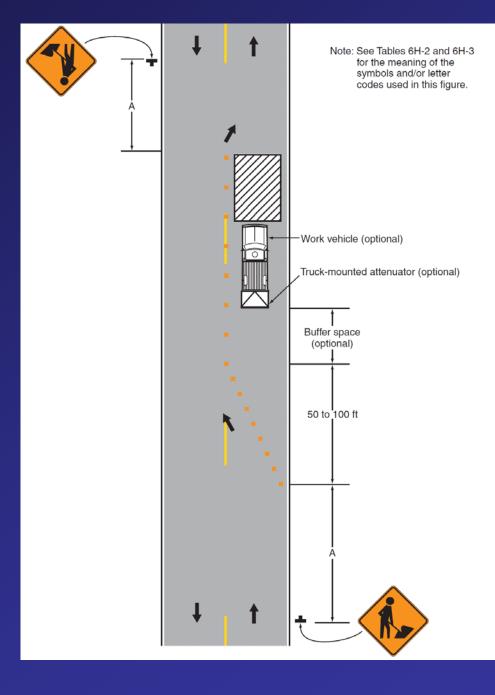


#### Type 2: Red/yellow lens AFAD



#### Clarified OPTION for self-regulating traffic movement through a onelane, 2-way constriction

- If work space is short (adequate sight distance)
  - If on a low-volume street





# Center Lane Closed Ahead symbol sign has been removed from the MUTCD

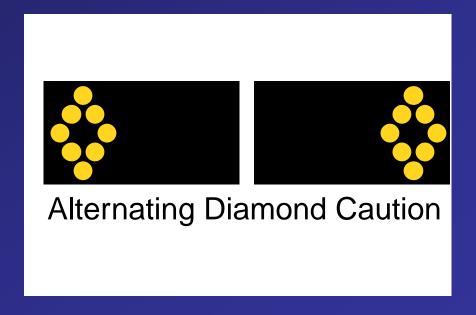






## New Alternating Diamond Display to indicate Caution on an Arrow Board







### Temporary Markings

- Delineate path through the TTC zone when the permanent markings are either removed or obliterated during the work activities.
- Should not be left in place longer than 14 days
- Some allowable exceptions to normal longitudinal markings requirements



## Preemption of Temporary Signals in TTC Zones



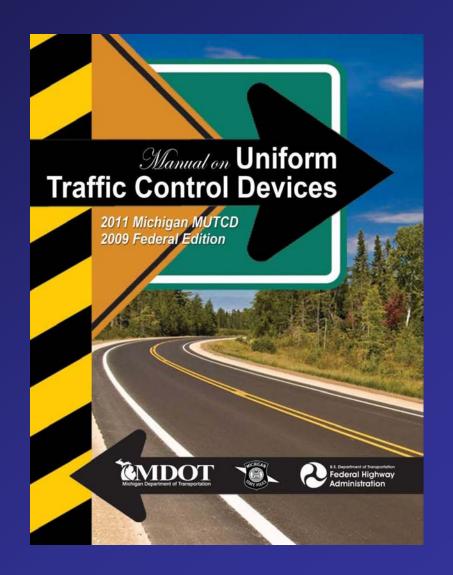


## Black and orange are acceptable colors for transverse rumble strips in TTC zones



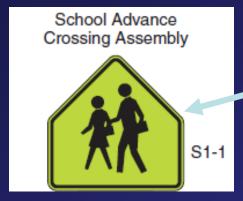
#### Part 7

### School Areas





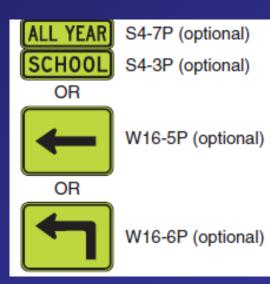
### New Plaques for School Area Signing



Existing school area signs



New plaque designs





## New Symbol Sign to replace the S3-1 word message sign

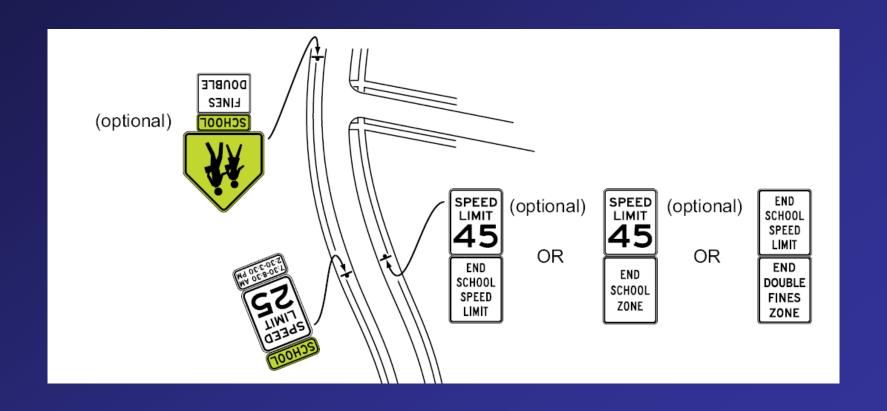




**S3-1** 



## END SCHOOL SPEED LIMIT or END SCHOOL ZONE Sign





### School Crossing Guard Apparel

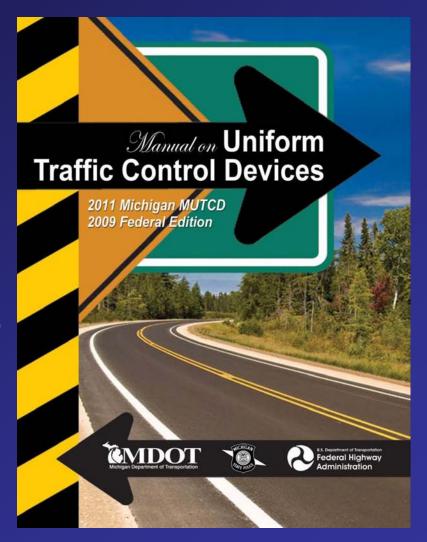


Adult guards and law enforcement shall use ANSI Class 2 safety apparel

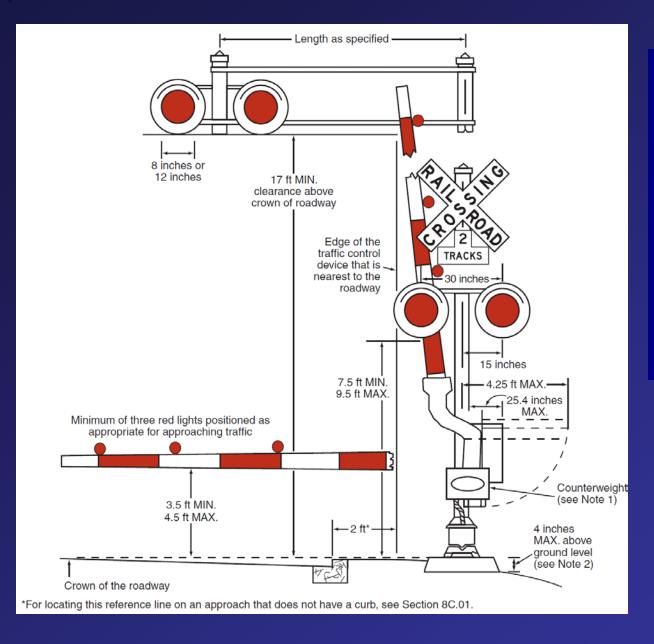
Compliance date of December 31, 2011

Part 8

### Railroad Grade Crossings







# Stripes on gate arms shall be vertical

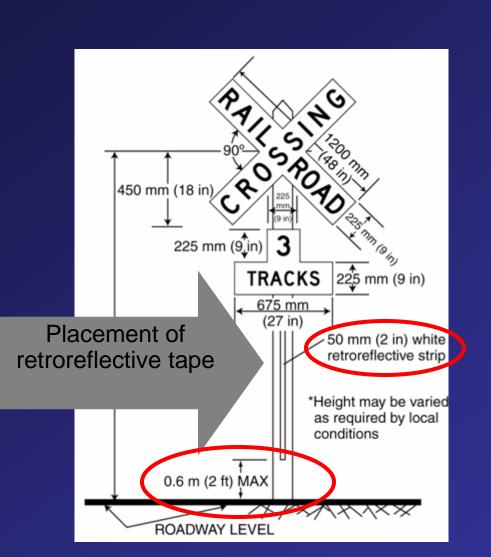


## Grade crossings within or in close proximity to circular intersections

- Engineering study required to evaluate potential queuing
- If queues impact crossing, provisions shall be made to clear highway traffic from the crossing before train arrivals



### Highway-Rail Grade Crossing Sign



 Retroreflective white material on crossbuck post and sign:

within 2 ft above the edge of roadway on the front and back.

back of each blade for the full length.

Compliance date of December 31, 2019



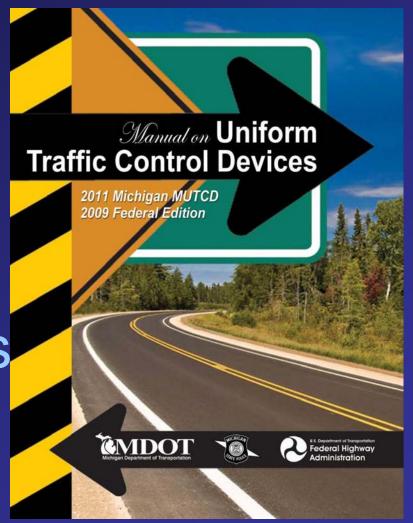
### YIELD or STOP Signs Required at Passive Highway-Rail Grade Crossings



Compliance date of December 31, 2019

Part 9

Bicycle Facilities





## New Bicycle Destination Guide Signs







### New Bicycle Route sign that provides a place for a pictograph





## Revised Design of the U.S. Bicycle Route Sign



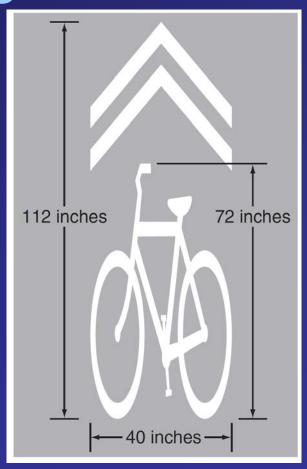


M1-9



## New Shared Lane Pavement Marking





### 2005 vs 2011 Michigan Differences

- Updated MVC references
- History of MMUTCD added
- May Be Icy sign replaced with Bridge Ices Before Road sign
- Advance Street Name sign shall provide advance information

### 2005 vs 2011 Michigan Differences

- Traffic Regulator sign sequence Be Prepared to Stop sign optional
- Worker Symbol sign back
- School Crossing sign now permitted as signalized locations
- School Bus Stop Ahead sign back
- Railroad pavement markings match federal MUTCD

#### Please take note!

 The Effective date of the MMUTCD is December 1, 2011.

 The Michigan Manual on Uniform Traffic Control Devices is the document for all Michigan road agencies to follow



#### Where to Find the MMUTCD

- Download the 2011 MMUTCD
  - http://mdotwas1.mdot.state.mi.us/public/tands/Details\_Web/mmutcdcompleteinteractive.pdf

- Order the 2011 MMUTCD
  - **1-517-322-1676**
  - #60 MMUTCD \$143.99
  - -#61 Part 6 free