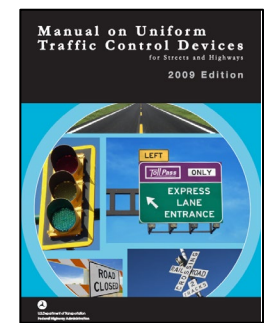
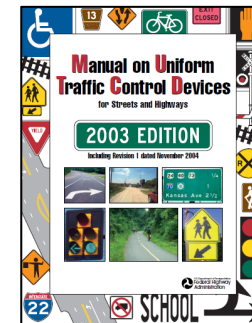
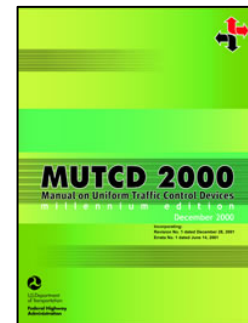
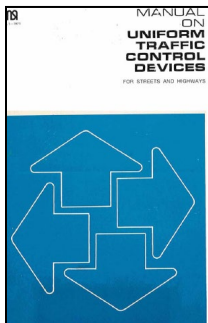
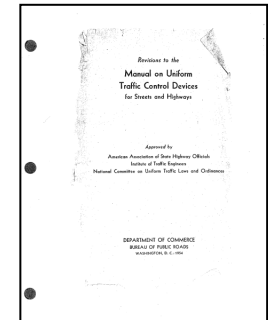
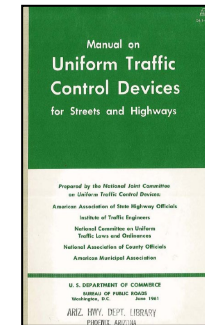
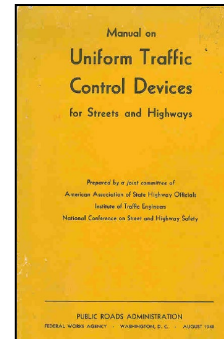
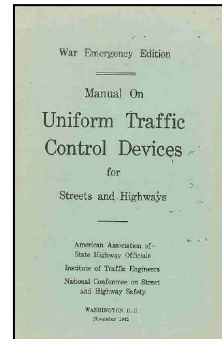
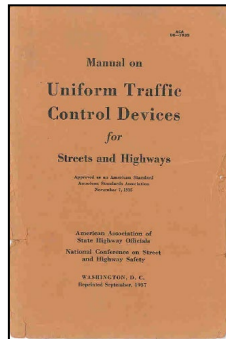
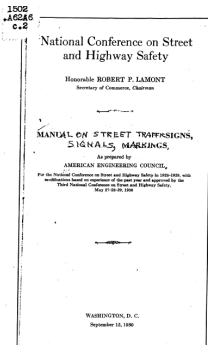


Manual on Uniform Traffic Control Devices

Proposed Changes for 11th Edition



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DTS Provident Design Engineering
February 10, 2022

Disclaimer

This presentation is not a comprehensive, item by item review. It concentrates on areas of significant change to Public Works and Transportation Professionals, and is not concentrated on any specific area of specialization.

All proposed changes are publicly available for more details.

What is A Traffic Control Device?

- Anything that communicates with the Road User about condition, direction, information relevant to the travel task as you use the road
 - Signs, Pavement Markings, Signals
- Must:
 - Fulfill a need
 - Command attention
 - Convey a clear simple meaning
 - Command respect from road users
 - Give adequate time for proper response



What is MUTCD?

- Manual on **Uniform** Traffic Control Devices.
- Adopted by 23 Code of Federal Regulations (CFR) Part 655, Subpart F as a requirement everywhere in the USA.
- First established in 1930.
- Latest edition is 2009, with 2 revisions.
- Regulates all Traffic Control Devices in U.S. on public roads or private roads open to public travel.
- Promotes safe and efficient utilization of road system.
- Concept is to treat same situations the same way to improve road user response and therefore safety.

What is MUTCD?

- States are permitted to develop their own MUTCD, so long as it meets the minimum standard of the MUTCD and is approved within 2 years of adoption of the MUTCD.
- Within MUTCD, items are expressed in these levels:
 - **STANDARD** = required, mandatory, or prohibited
 - GUIDANCE = recommended, but not mandatory, practice
 - OPTION = allowable modifications to standard or guidance
 - SUPPORT = informational statement
- Current MUTCD contains over 900 standard statements. Proposed MUTCD to contain over 1100.

Process

- Notice of Proposed Amendments published in Federal Register on December 14, 2020
 - Contains 647 proposed changes
 - 15% more standard statements than current (1,100)
- Comments were due by May 14, 2021
 - 26,522 comments
- Comment resolution still underway

New Compliance Dates After Update of Manual

- Low Clearance Signs – 5 years
- High Profile Grade Crossing Signs – 10 years
- Traffic Signals at/near Grade Crossings – 10 years
- If no compliance date is specified, then compliance is achieved through **systematic upgrading** as existing devices wear out and need to be replaced.

EXAMPLE OF USEFUL LIFE: PennDOT uses 18 years for life of a sign

Applies to Public AND Private

- Language changes from “Private Road Open to Public Travel” to “Site Roadways Open to Public Travel”
 - Expanded list of example locations mentioning private or public ownership. Impacts Liability and Federal Funding.
- New definition for “Right of Way, Public Highway”
 - Includes full right of way, and rest areas, scenic overlooks, and weigh stations
- New definition for “Shoulder”

Major Emphasis of Changes

- Edge and Lane Line Pavement Marking Widths
- Speed Limit Setting
- Crosswalk Markings
- Pavement Colors
- Revised Stop, Yield and All-Way Stop application guidance and warrants
- Volume/functional classifications for Horizontal Curves
- MULTI-MODAL
 - bicycles, automated vehicles, transit, pedestrians



Engineering Study Emphasis

- The decision to establish a **Multi-way Stop** or **Traffic Signal** control at an intersection is based on an Engineering Study.*
 - Numerical Warrants are part of the study (not the sole criteria)
- Setting **Speed Limits** requires an Engineering Study.* Expanded factors proposed.

*NOT a change from the 2009 MUTCD

Lane and Edge Line Widths

- Due to both Automated driving systems and safety research into human factors
 - Proposed normal width lines as:
 - 6" wide for freeways (*currently 4"*)
 - 6" wide where speed limit greater than 40 mph
 - 4" to 6" wide for all other roadways (*so may not impact local roads*)
 - Proposed wide lines as:
 - 8" where 4" to 5" are normal line widths
 - 10" wide where 6" normal line widths
- This Overall Section may be modified.*

Lane and Edge Line Widths

- ITE is concerned that cost implications haven't been assessed
- Given that there is no standard for assessing condition of lane markings, wider lines would last longer, as there is 50% more material to wear away versus 4" edge lines
- At least 30 states have policies for the use of 5-6" edge lines already
- Highway Safety Manual research has found that 6" edge lines reduce fatal and injury crashes by 15.4-37.7% (versus 4" edge lines)

Speed Limit Sign



2009 MUTCD (current)

- Engineering study **required**
- Speed distribution in study **required**
- Recommended that speed be within 5 mph of the 85th percentile speed
- Factors included in the engineering studies are **optional**

Proposed

- Engineering study required
- Speed distribution in study recommended
- 85th percentile speed only recommended for freeways, expressways, and rural arterials
- Expanded Factors included in the engineering studies are recommended

Expanded Factors in Speed Studies

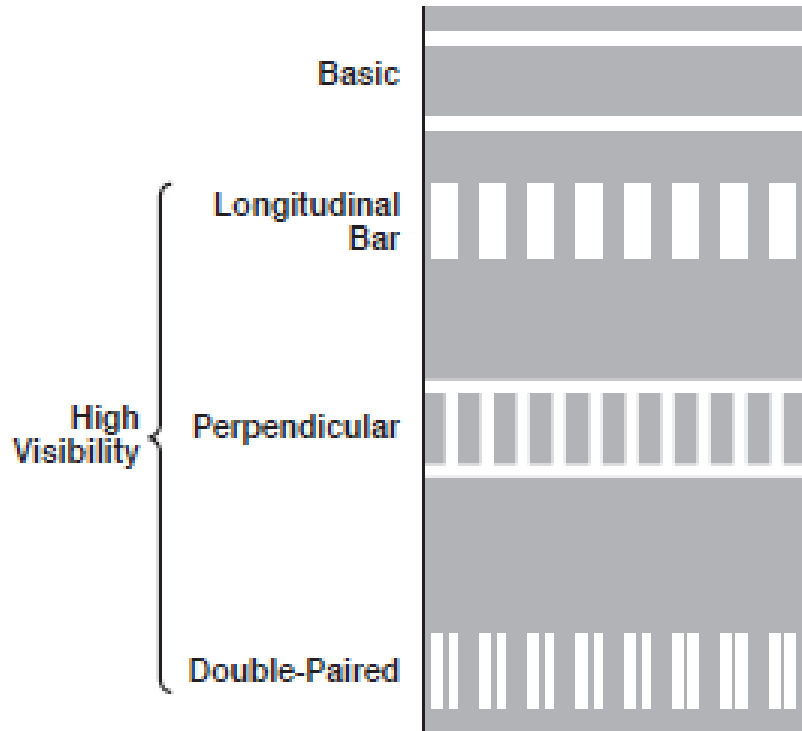
- Speed distribution
- Crash experience
- Road characteristics
 - Lane widths, shoulder condition, sight distance.
Grade, alignment, median type
- **Road context**
 - Roadside development and environment,
functional classification, curbside uses and
activity, pedestrian activity, bicycle activity

History of Speed Limits

- The 1948 Edition first recommended speed studies to establish speed limits.
- The 1971 Edition mentioned both 85th percentile speed and pace speed (the highest frequency 10 mph range) equally
- The 2000 Edition added guidance that the speed limit should be within 5 mph of the 85th Percentile speed.
- The use of the 85th Percentile speed has been a large problem for speed management, and a major source of concern for the safety of bicycles and pedestrians in urban areas

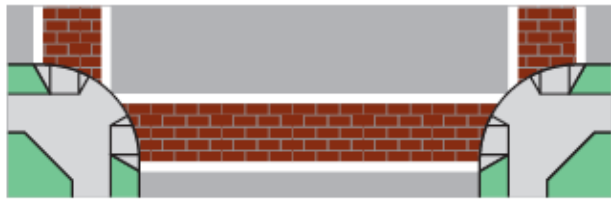
Crosswalks

- New Guidance:
 - *Because non-intersection pedestrian crossings are generally unexpected by the road user, warning signs and high visibility crosswalk markings should be installed. Reasons – visibility, driver compliance and pedestrian compliance.*
- Curb ramps now need to be within crosswalk lines
- No more restriction on mid-block crosswalks within 300 feet of an existing signal















Crosswalks

- New Guidance on decorative treatments
- New section on RRFBs
- Hybrid beacons now allowed at intersections and driveways



Examples of:

Material	Geometry	Color
 Brick	 Lattice	 Red
 Stone	 Mesh	 Brown
 Paver	 Grid	 Tan
 Cobble	 Polygon	 Clay



Crosswalks at Signals

- Ped heads required at all signalized intersections with crosswalks
- Buffer now 2 sec. instead of 3 sec. from FDW to Green
- Clearance time now includes shoulder instead of just edge of traveled way
- Inclusion of touch-free pedestrian buttons
- New figures for push button placement



Warrants – Major Revisions including when to install Stop Sign

- Minor Street or All-way Stops:
 - *More specific warrants, including crash experience thresholds and sight distance.*
 - *Bicycle and pedestrian needs included.*
- Signals:
 - Engineering study no longer requires all information
 - Warrants themselves are no longer standards (which allows for signals that don't meet warrants based on engineering judgement)
 - Significant revisions to crash warrant
 - No more prohibition of school or pedestrian signals within 300 feet of another signal
 - No changes to volume warrants



Warrant 7 - Crash Experience

- Already Approved via Interim Approval 19
- Expanded criteria:
 - 1-year and 3-year crash evaluation periods
 - Crash type and severity
 - Population
 - Speeds greater than 40 mph
 - Intersection geometry
(different criteria for “T” vs. 4-Way)



Issues with Signal Warrants

- Peak Hour and volume warrants have remained unchanged since 1978
- 8 hour volume warrants have remained unchanged since 1961, and were for pre-timed signals at that time
 - Actuated signals could skip minor street volume warrants in 1961. This was removed in 1971.
- The requirement that crashes have to be reportable creates inconsistencies by jurisdiction
 - 16 states little or any damage is reportable, while in 3 states one vehicle needs to be towed



What is a REPORTABLE Crash?

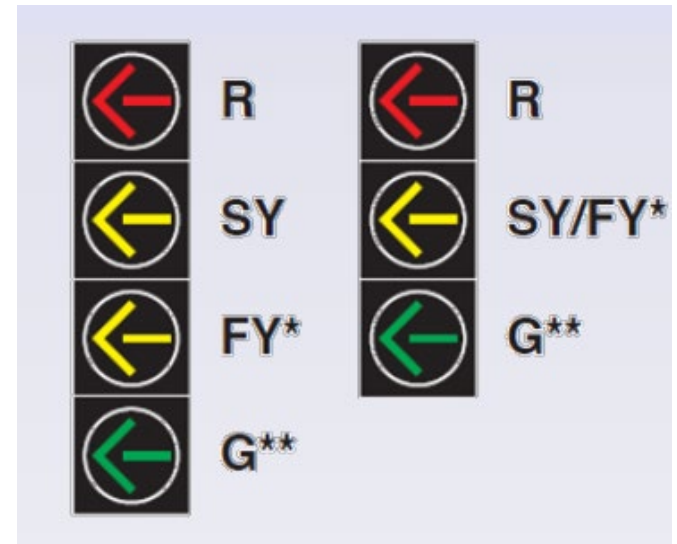
(Not just what is reported to Police)

- Injury, fatality, or Property Damage of varying amount
 - 3 states – any damage
 - 13 states - \$300-\$700 total damage
 - 19 states - \$1,000-\$1,500 total damage
 - 10 states - \$1,000-\$2,500 damage to one party
 - 2 states - \$3,000 total damage
 - 3 states – one or more cars can't drive away

Flashing Yellow Arrow

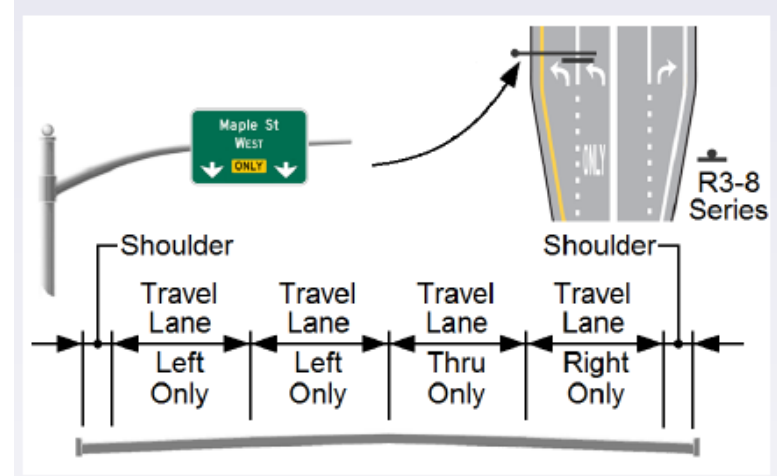
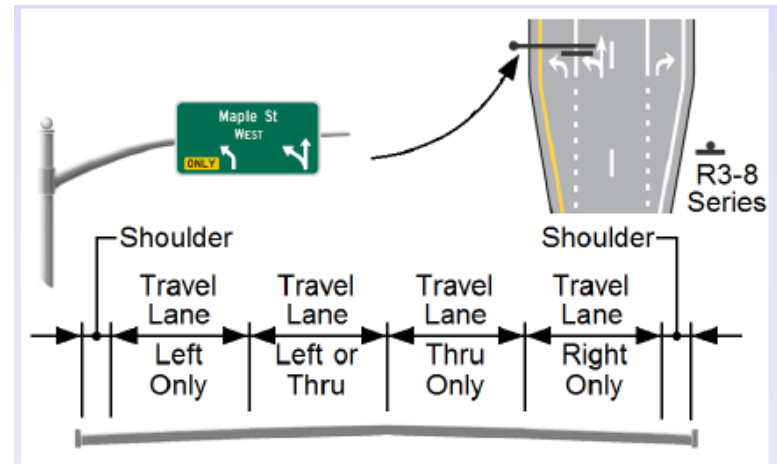
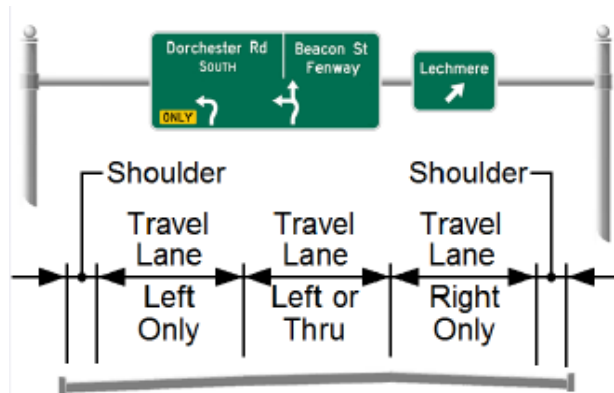
(Not common in this area)

- Already Approved via Interim Approval 17
- Improves safety and provides more left-turn phasing options
- Optional use in three-section and five-section signal faces
- Flashing and steady yellow arrows in same signal section



Overhead Signs on Conventional Roads

- Proposed letter size commensurate with context
 - Smaller signs: mast-arms, lighter-weight structures
 - Better suited to urbanized conditions where needed



Horizontal Curves

(Results in 30% of accidents)

- Delete reference to 1,000 AADT. Replace it with this table:

Table 2C-4a - Selection of Devices for Changes in Horizontal Alignment¹

Roadway Condition	AADT			
	< 1000	1000-2999	3000-3999	>3999
Freeways and Expressways	Required	Required	Required	Required
Arterial or Collector without Pavement Markings	Optional	Recommended	Required	Required
Arterial or Collector with Pavement Markings ²	Optional	Recommended	Recommended	Required
All other roadways	Optional	Optional	Optional	Optional

¹ Devices as indicated in Table 2C-4b

² An arterial or collector are considered to have pavement markings when either a center line, edge line, or both are present.

Horizontal Curves

Table 2C-4b - Application of Devices for Changes in Horizontal Alignment

Speed Differential	Devices for Change in Horizontal Alignment ¹	Use of Advisory Speed Plaque (W13-1P) ⁴
5 mph	Pavement markings or advance horizontal alignment warning sign on paved roadways. Advance horizontal alignment warning sign on unpaved roadways. ²	Optional
10 mph	Advance horizontal alignment warning sign	Recommended
15 mph	Delineators ³ and advance horizontal alignment warning sign	Required
20 mph or more	Chevrons ³ and advance horizontal alignment warning sign	Required

¹ The provisions for the use of Horizontal Alignment warning signs and devices are contained in Section 2C.06 and Table 2C-4a.

² A roadway is considered to have pavement markings when either a center line, edge line, or both are present.

³ See Section 2C.06 for the use of a One Direction Large Arrow (W1-6) sign in place of or to supplement delineators and chevrons.

⁴ See Section 2C.59

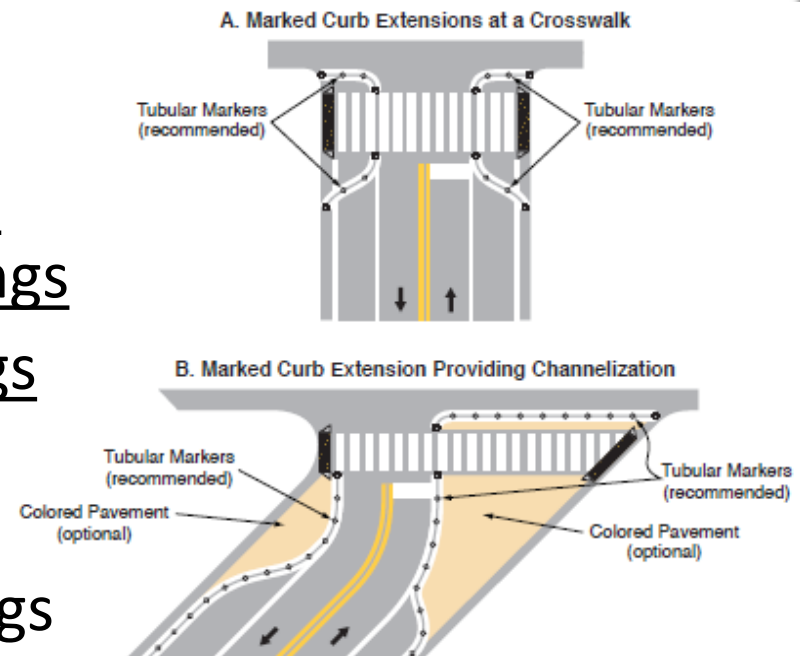
Vehicle Speed Feedback Sign

- Standardized designs for sign and plaque
- Background color is yellow as the sign message is a warning, not a regulation
- Provisions for use with Speed Limit sign and Horizontal Alignment signs
- Determined to be effective 5 years later (especially on pace speed instead of 85th Percentile)



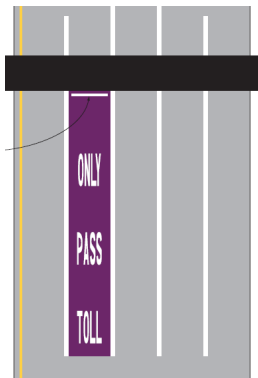
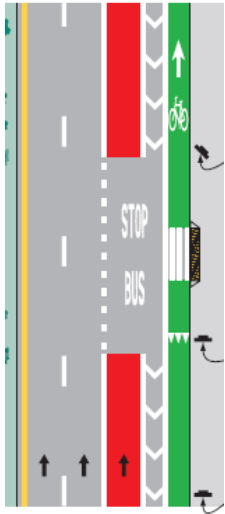
Islands and Curb Extensions

- New section on islands designated by pavement markings (as opposed to raised islands)
- New section on curb extensions designated by pavement markings
- New section on tubular markings
- New section on obstructions in roadway, which require object warnings and pavement markings (this was the case in the current manual, but it is spelled out better)
 - This includes raised channelization islands

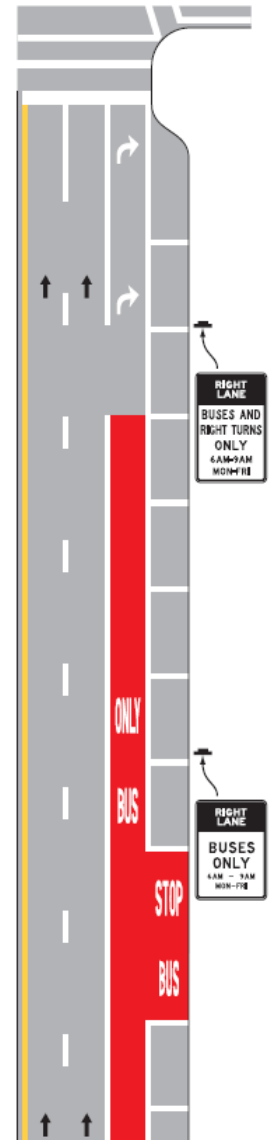


Colored Pavement

(Major Change)

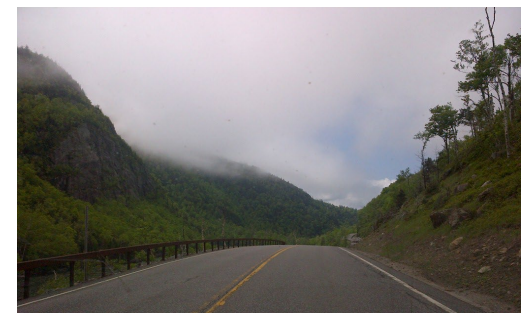
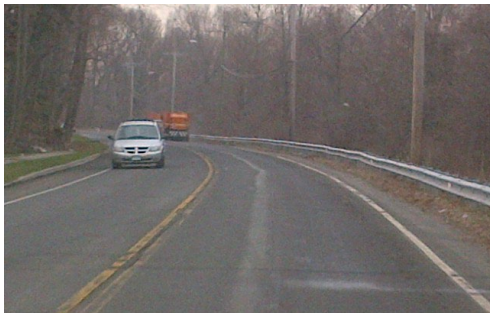


- Yellow-colored pavement:
 - *Areas separating opposing*
- White-colored pavement:
 - *Areas separating same direction traffic and right-side shoulders*
- Green-colored pavement:
 - *Bicycle only facilities*
- Red-colored pavement:
 - *Transit only or transit preferential lanes*
- Purple-colored pavement:
 - *Lanes within and entrances to an open-road tolling facility*



Elimination of Low Volume Road Chapter

- In the 2009 Manual, Part 5 was dedicated to Low Volume Roads
- Low volume roads were defined as roads with less than 400 vehicles per day outside of built-up areas of towns, cities, and communities
- Everything from this section has been relocated to options in the appropriate sections



Automated Vehicles – New Section

- New section – *not a requirement*
- **Agencies decide whether to fit roads for AV**
- New section provides agencies interested in AV systems a set of criteria, using current body of knowledge
- Recommended factors include:
 - Line widths
 - Sign orientation
 - Refresh/flicker rate for LED signs, signals (can cause Epileptic seizures)
 - “Ghost” lines in work zones

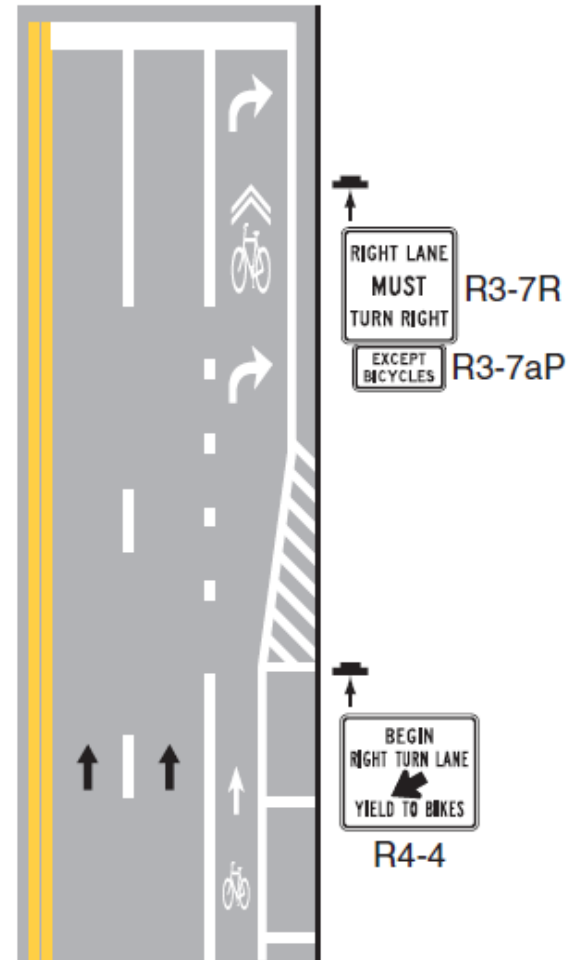
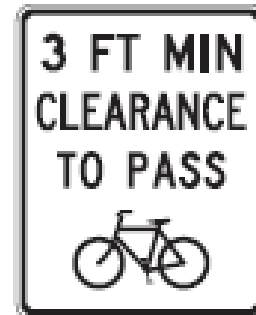
Temporary Traffic Control

- Most changes are just rearranging information
- Changes related to accommodation of pedestrians with disabilities, including elimination of consideration of “level of usage by pedestrians with disabilities” in design decisions
 - *All pedestrian detours need to be accessible, PERIOD!*



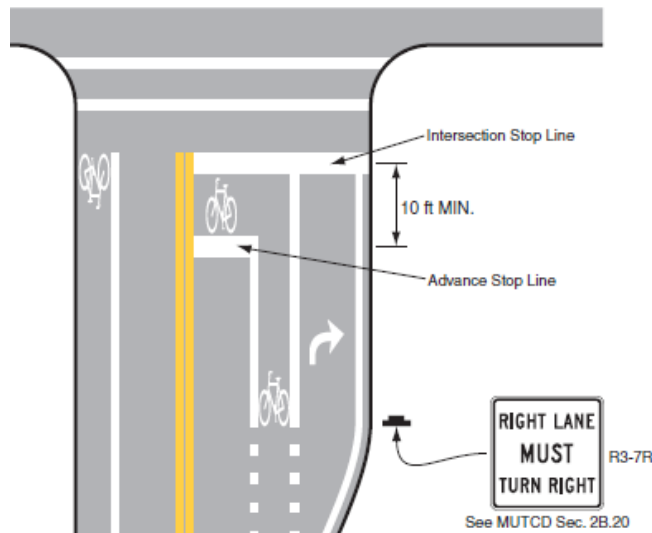
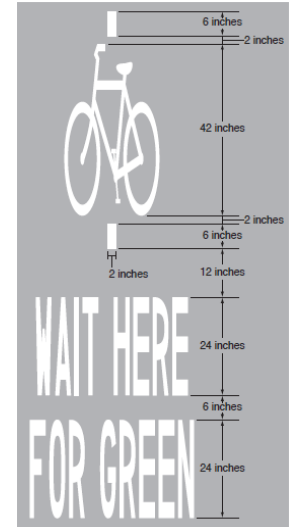
Bicycle Signage / Pavement Markings

- Several new signs
- New requirements on placement of shared lane markings (sharrows)



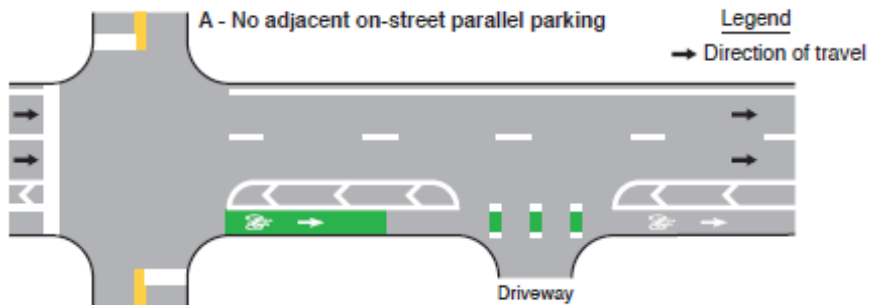
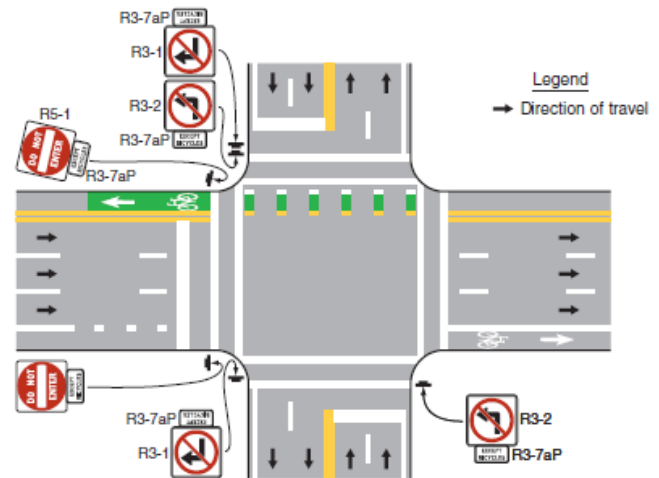
Bicycles at Signalized Intersections

- Bicycle signals
- Two-stage bicycle turn boxes
- Intersection bicycle boxes
- Bicycle detector markings



Bicycle Lanes

- Green colored pavement
- Separated bicycle lanes
- Buffered bicycle lanes
- Contra-flow facilities



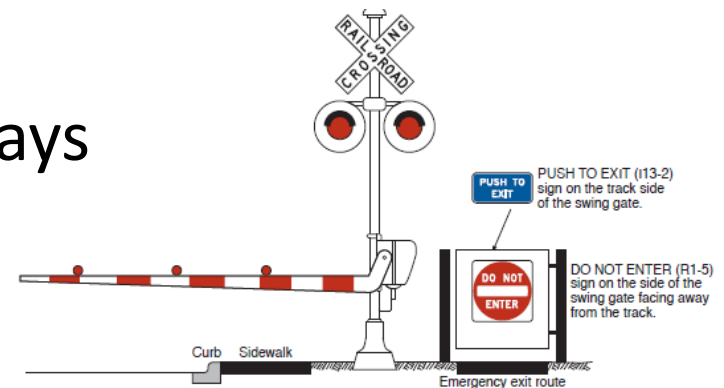
Busway Grade Crossings

- Addresses buses in semi-exclusive alignments
- Proposed Guidance recommends equipping busway grade crossings with **active warning systems** (flashing light signals)
- Provides Option for automatic gates to be used
 - Gates would need to comply with provisions for rail grade crossings



Light Rail Transit (LRT) Grade Crossings

- Proposed requirement for at least one crossbuck per approach
- Proposed requirement to use active traffic control systems where **LRT speeds exceed 25 mph**
- Revise existing Standard to require automatic gates where **LRT speeds exceed 40 mph** (as 35 mph)
- Similar requirements for pathways and sidewalks within 25 feet of crossing



Questions



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DTS Provident Design Engineers**

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