

Traffic Control Devices (TCDs)

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SACRAMENTO
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MINETA
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Preparing Today's Workforce for Tomorrow's Autonomous
Transportation: Bridging Electrical and Civil Engineering

Learning Objectives

- 1 **Identify** the main types of traffic control devices and their purposes.
- 2 **Explain** the principles that govern the design and use of traffic control devices to promote safety and efficiency.
- 3 **Apply** MUTCD color, shape, and pattern conventions to interpret traffic control information.
- 4 **Distinguish** between regulatory, warning, and guide signs based on their visual characteristics and functions.
- 5 **Evaluate** the appropriate selection and placement of traffic control devices for different roadway conditions.
- 6 **Design** a basic traffic control device layout that complies with MUTCD standards and principles.

Introduction

- The purpose of traffic control devices (TCDs), as well as the principles for their use, is to promote:



highway safety, inclusion, and mobility of all road users



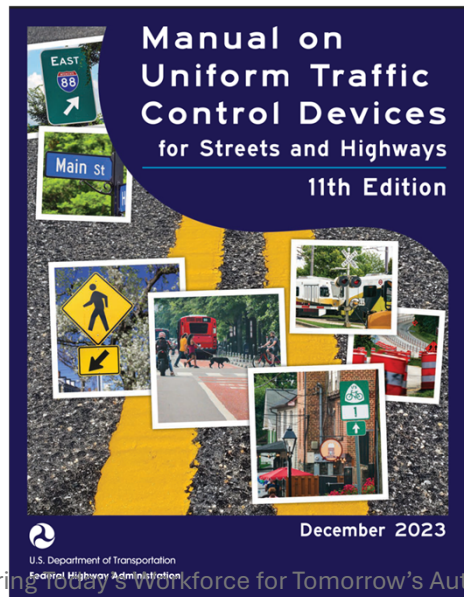
efficiency by providing for the orderly movement of road users on streets, highways, bikeways, and site roadways open to public travel.

How to Design TCDs?

- Manual on Uniform Traffic Control Devices (MUTCD)

National

https://mutcd.fhwa.dot.gov/kno_11th_Edition.htm



State

<https://dot.ca.gov/programs/safety-programs/camutcd>



Different Types of TCDs?

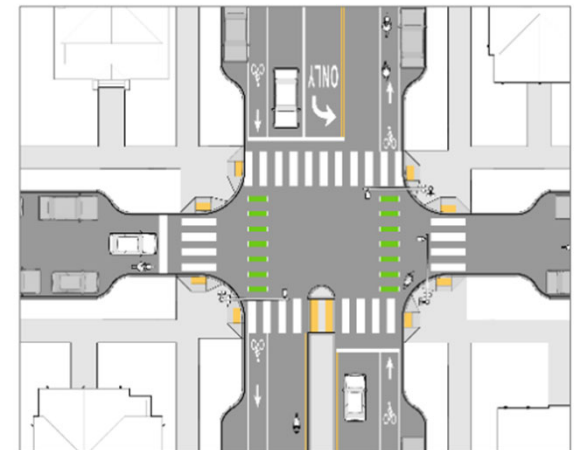
Traffic Signs



Traffic Signals



Pavement Marking



TCD Principles



Fulfill a need.



Command attention.



Convey a clear, simple meaning.



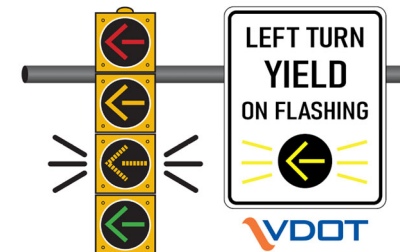
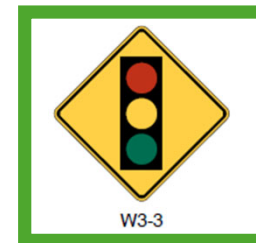
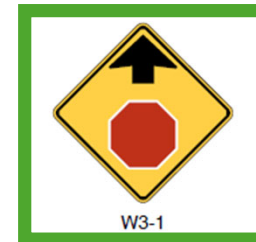
Command respect from road users.



Give adequate time for a proper response.

TCDs Design and Placement of Information

- Primacy: placement determined by importance.
- Spreadity: distribute information over a distance.
- Codity: organize information into smaller units.
- Redundancy: convey information in multiple ways.



Information Transfer: Color

A total of **13 colors** have been identified as being appropriate for use in conveying traffic control information:

- Black: regulation
- Blue: road-user services guidance, tourist information, and evacuation route
- Brown: recreational and cultural interest area guidance
- Coral: reserved for future designation
- Fluorescent Pink: incident management
- Fluorescent Yellow-Green: pedestrian warning, bicycle warning, playground warning, school bus warning, and school warning



R2-1



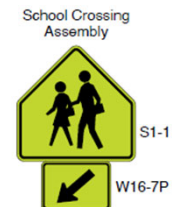
D5-7



RS-145
Beach



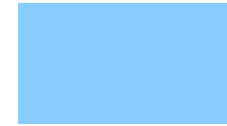
M4-9



Information Transfer: Color

A total of **13 colors** have been identified as being appropriate for use in conveying traffic control information:

- Green: indicated movements or actions permitted and direction guidance
- Light Blue: reserved for future designation
- Orange: temporary traffic control
- Purple: restricted to use only by vehicles with registered electronic toll collection (ETC) accounts
- Red: stop or prohibition
- White: regulation
- Yellow: warning



Information Transfer: Shape



R1-1



R1-2



W3-3



W16-7P*



R5-1



R15-1



W10-1



Interstate Route Sign
M1-1



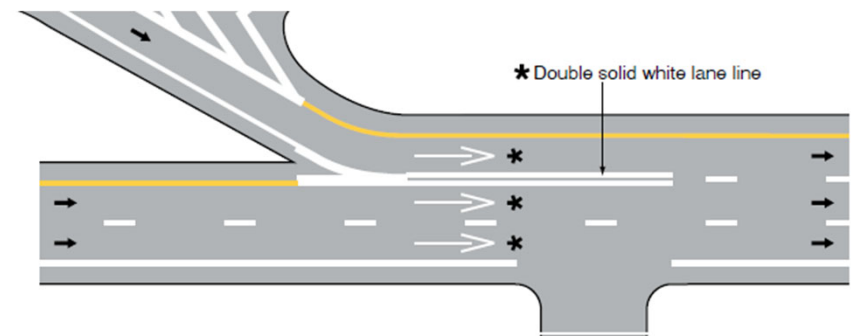
County Route Sign
M1-6



Forest Route Sign
M1-7

Information Transfer: Pattern

- A solid line discourages or prohibits crossing (depending on the specific application).
- A double line indicates maximum or special restrictions.
- A broken line indicates a permissive condition.

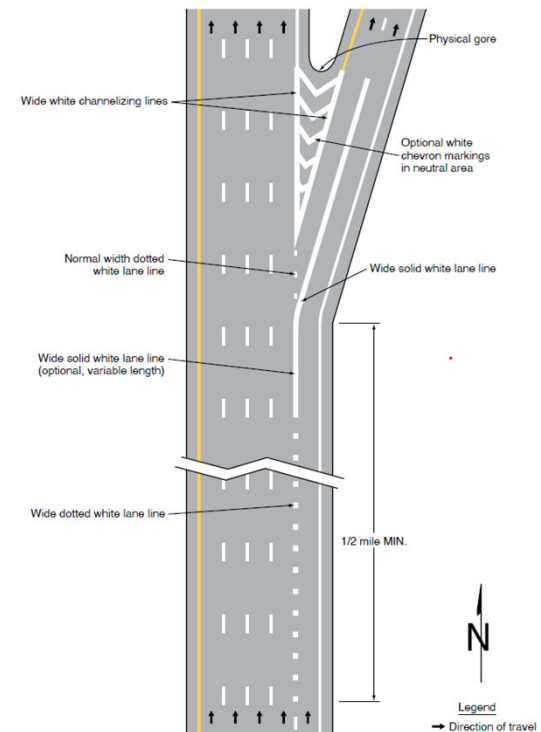
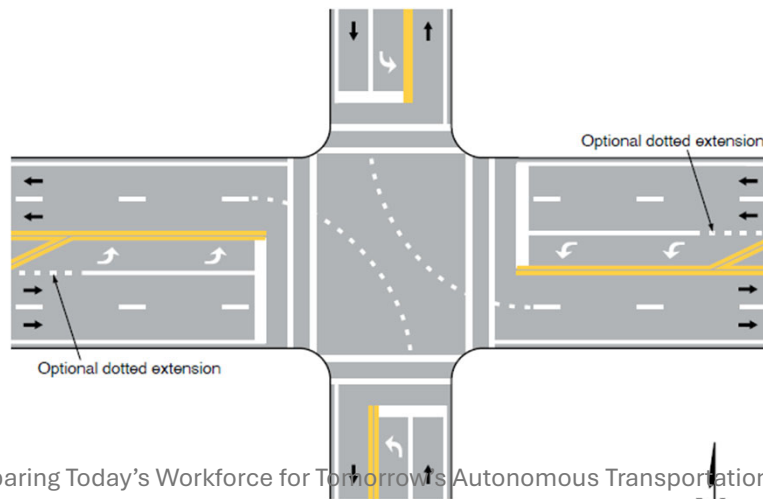


A – Three-lane, two-way marking with passing permitted in single-lane direction



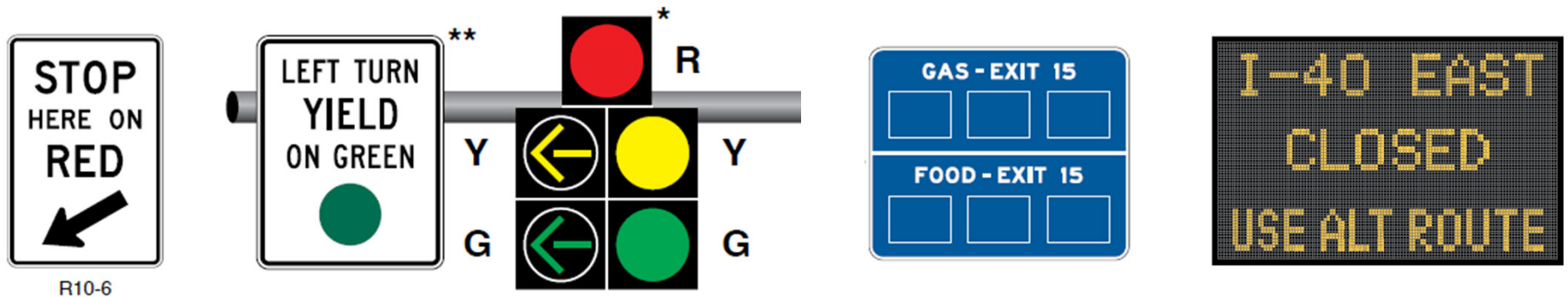
Information Transfer: Pattern

- A dotted lane line provides warning of a downstream change in lane function.
- A dotted line used as a lane line or edge line extension guides vehicles through an intersection, a taper area, or an interchange ramp area.



Information Transfer: Legend

Legends must be simple, short, and specific to traffic signs.



Traffic Signs

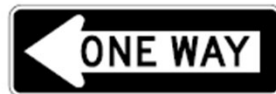
- Regulatory: informs users of regulations
 - Typically, black/red/white text/symbol on a white background or white text on a red background.



R2-1



R7-2



R6-1



R1-2



R1-1



R5-1



R5-1a

Traffic Signs

- Warning: alert users to unexpected conditions
 - Typically, black text/symbol on a yellow background.



W8-1



W8-5



W3-1



W3-2



W3-3

Traffic Signs

- Guidance: direct road users
 - Typically, white text on a green/blue/brown background.



D17-5

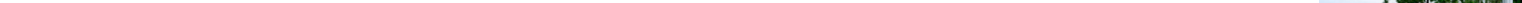


M11-1

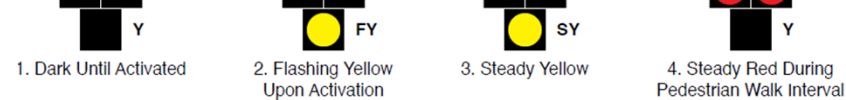


D5-7

A – Vertical signal faces

- 

B B B B B B SB

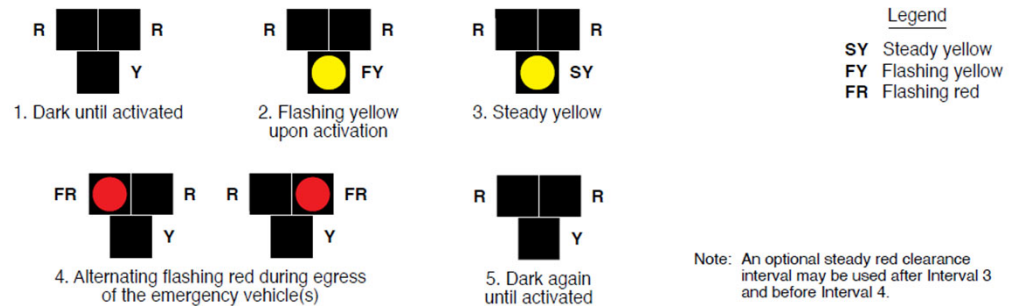


Traffic Signals

MUTCD defines 9 types of traffic signals:

- Emergency vehicle traffic control signals
- Traffic control signals for one-lane, two-way facilities

Figure 4N-1. Sequence for an Emergency-Vehicle Hybrid Beacon



Traffic Signals

MUTCD defines 9 types of traffic signals:

- Traffic control signals for freeway entrance ramps
- Traffic control signals for movable bridges
- Lane-use control signals
- In-roadway lights

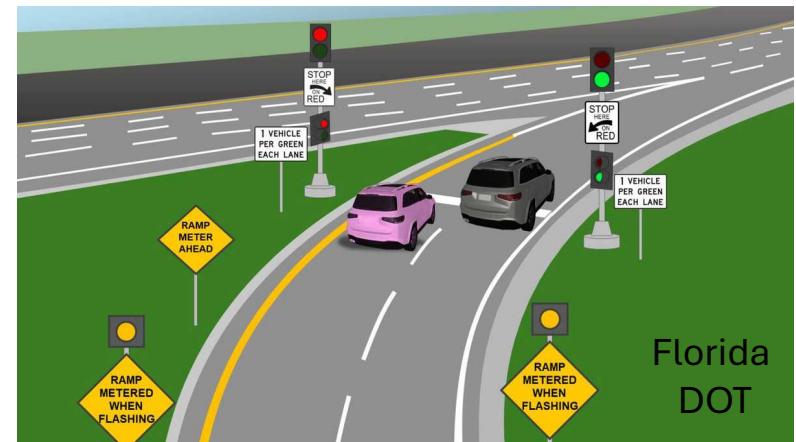
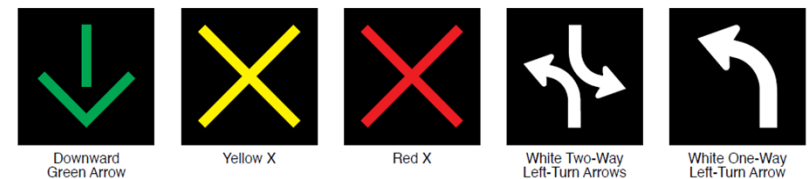
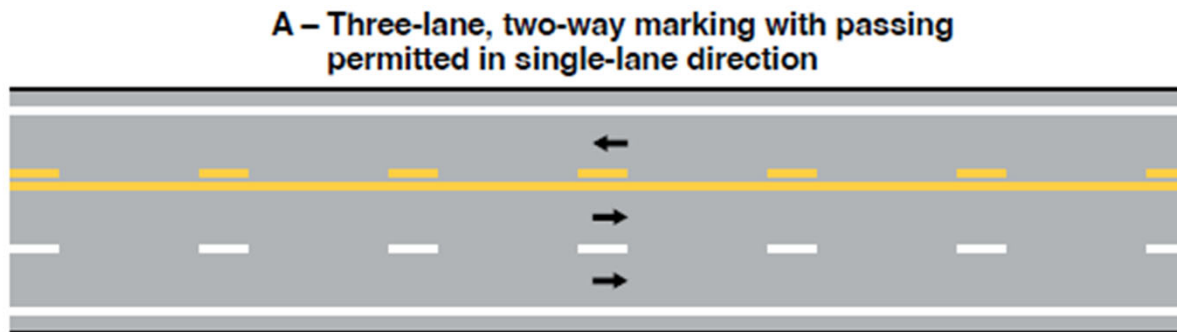


Figure 4T-1. Lane-Use Control Signal Indications



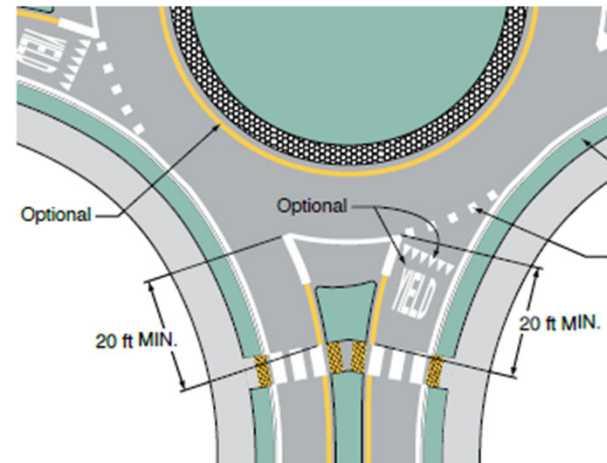
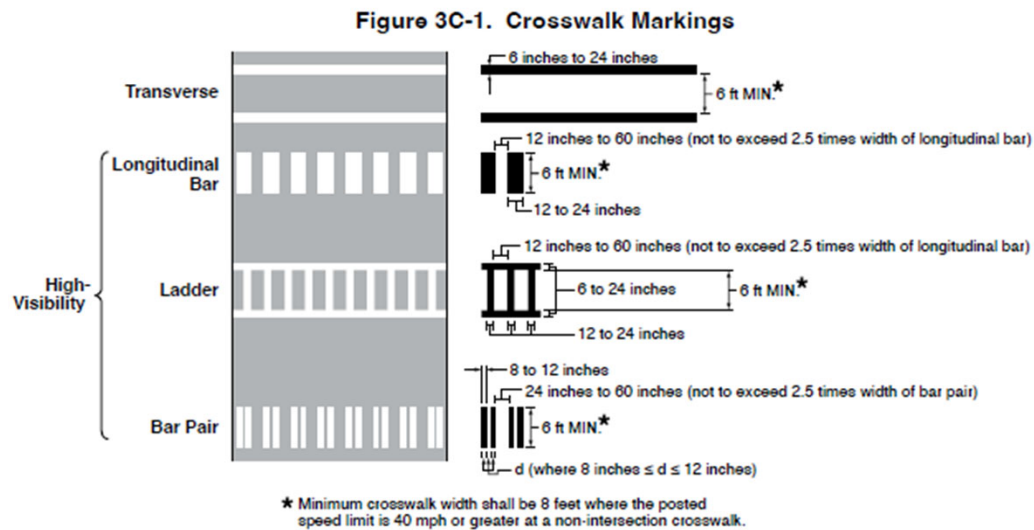
Pavement Markings

- Longitudinal Marking: provides parallel information
 - Centerlines, lane markings, and edge marking.



Pavement Markings

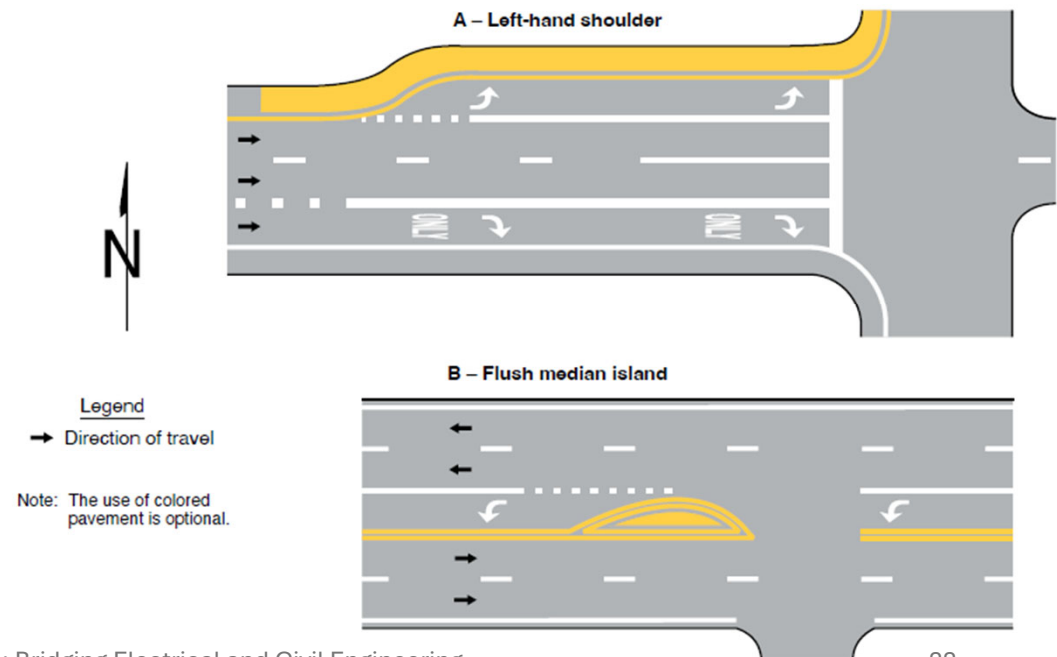
- Traverse Marking: provides cross-sectional information



Pavement Markings

- Colored Pavement: provides lane-use information
 - Yellow: used to enhance the conspicuity of areas separating traffic traveling in opposite directions of travel and the left-hand edge of the roadway.

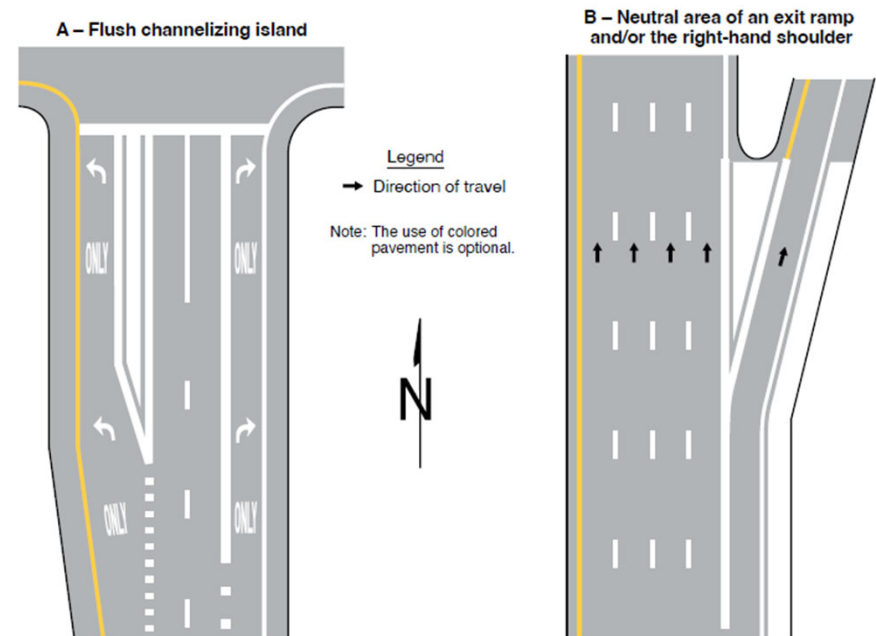
Figure 3H-2. Examples of Yellow-Colored Pavement Applications



Pavement Markings

- Colored Pavement: provides lane-use information
 - White: used to enhance the conspicuity of areas separating traffic traveling in the same direction of travel and the right-hand edge of the roadway.

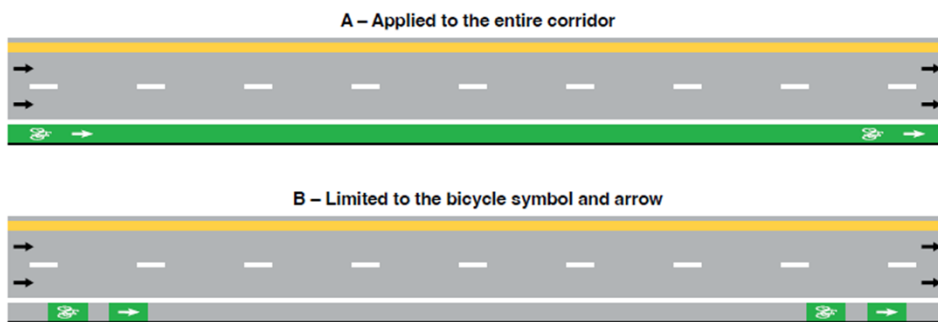
Figure 3H-3. Examples of White-Colored Pavement Applications



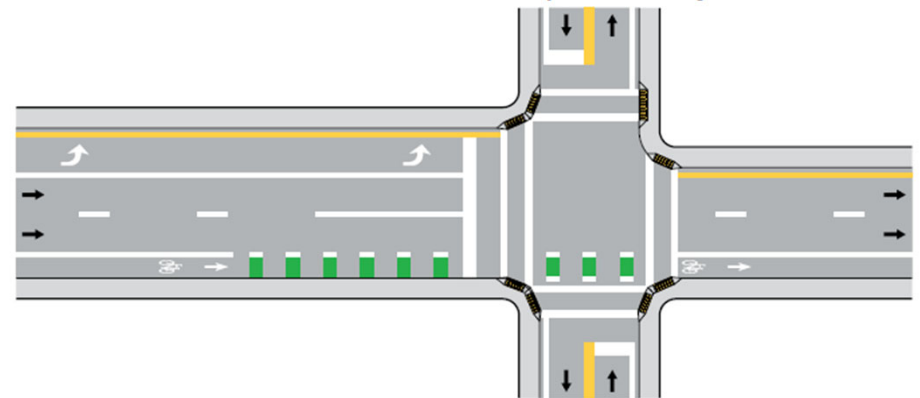
Pavement Markings

- Colored Pavement: provides lane-use information
 - Green: used to enhance the conspicuity of locations where bicyclists are expected to operate, and areas where bicyclists and other traffic might have potentially conflicting, weaving, or crossing movements.

Figure 3H-4. Examples of Green-Colored Pavement Applications



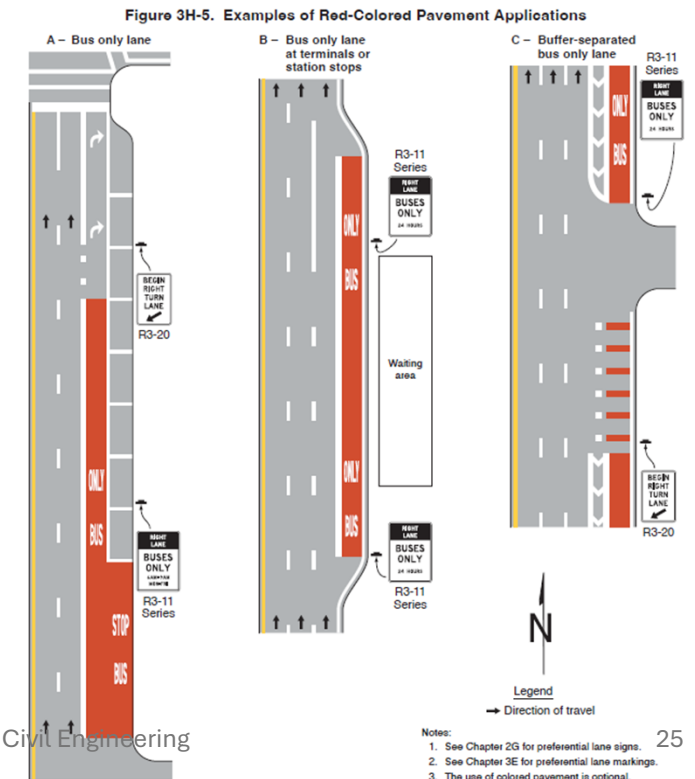
D – Applied supplementing the dotted line approaching intersections and/or the dotted extensions of bicycle lanes through intersections



Pavement Markings

- Colored Pavement: provides lane-use information

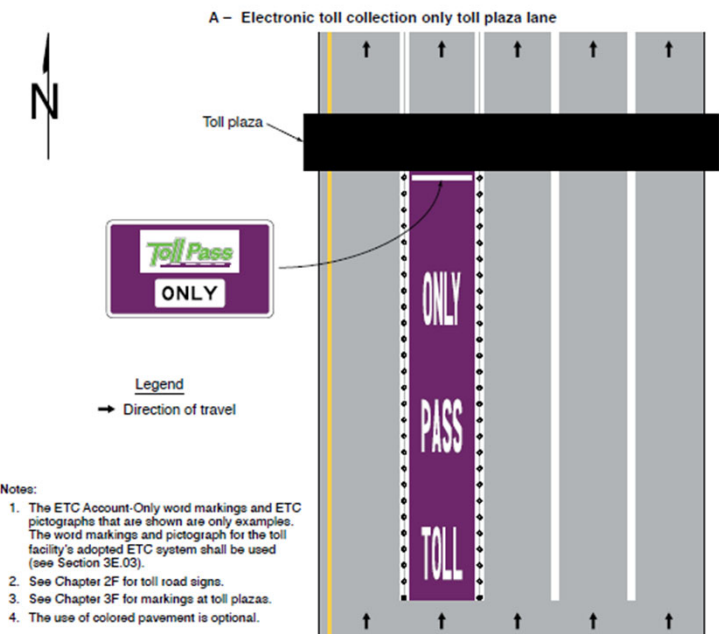
- Red: used to enhance the conspicuity of locations, station stops, or travel lanes in the roadway exclusively reserved for vehicles of public transit systems or multi-modal facilities where public transit is the primary mode.



Pavement Markings

- Colored Pavement: provides lane-use information
 - Purple: used on the approach to a toll plaza where the lane is restricted to use only with a registered ETC account.

Figure 3H-6. Examples of Purple-Colored Pavement Applications (Sheet 1 of 2)



References

- Manual on Uniform Traffic Control Devices. FHWA, U.S. Department of Transportation, Washington, D.C., 2023