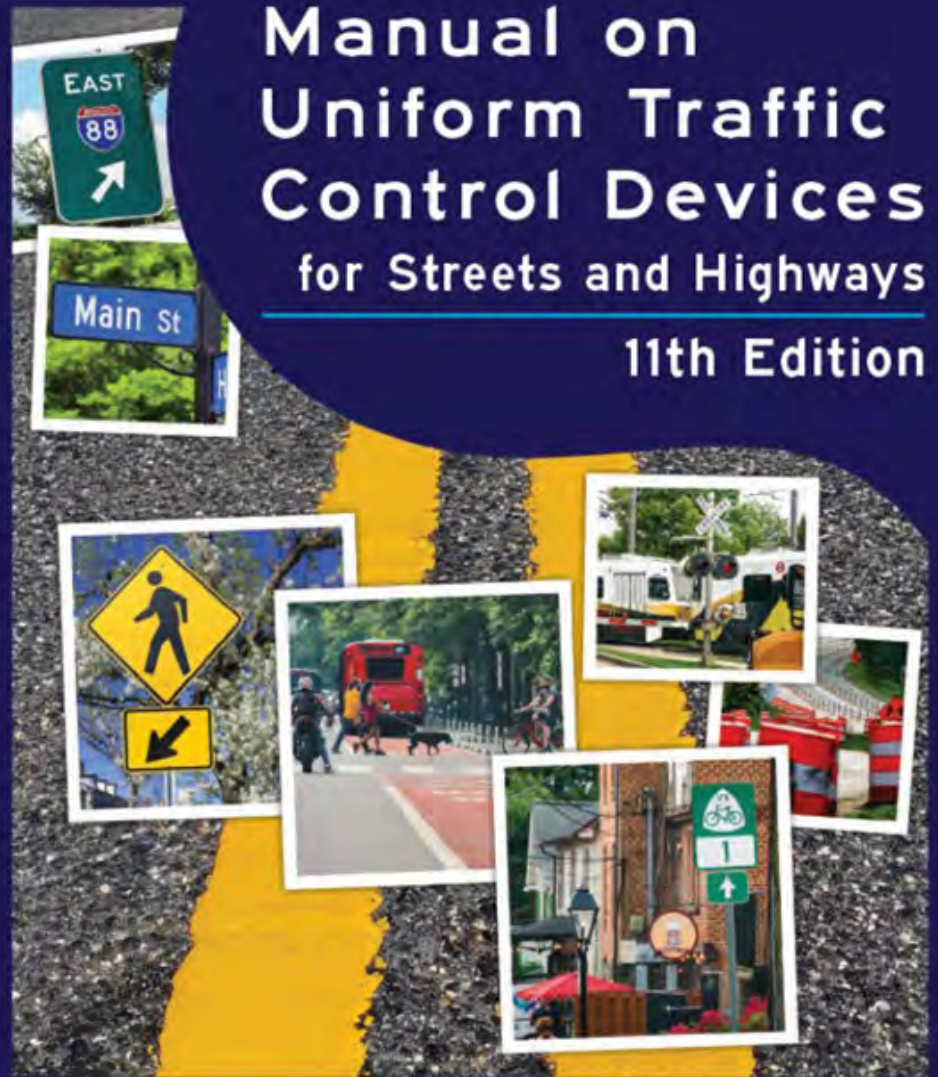

INTRODUCTION TO PART 5 TRAFFIC CONTROL DEVICE CONSIDERATIONS FOR AUTOMATED VEHICLES

MD CAV WORKING GROUP
AUG 25, 2024

PANEL SESSION

NEXT GENERATION OF THE MANUAL ON
UNIFORM TRAFFIC CONTROL DEVICES (MUTCD):
PREPARING FOR AUTOMATED VEHICLES

Manual on Uniform Traffic Control Devices for Streets and Highways 11th Edition



December 2023



U.S. Department of Transportation
Federal Highway Administration

ABOUT ROXANE

DISCLAIMER:

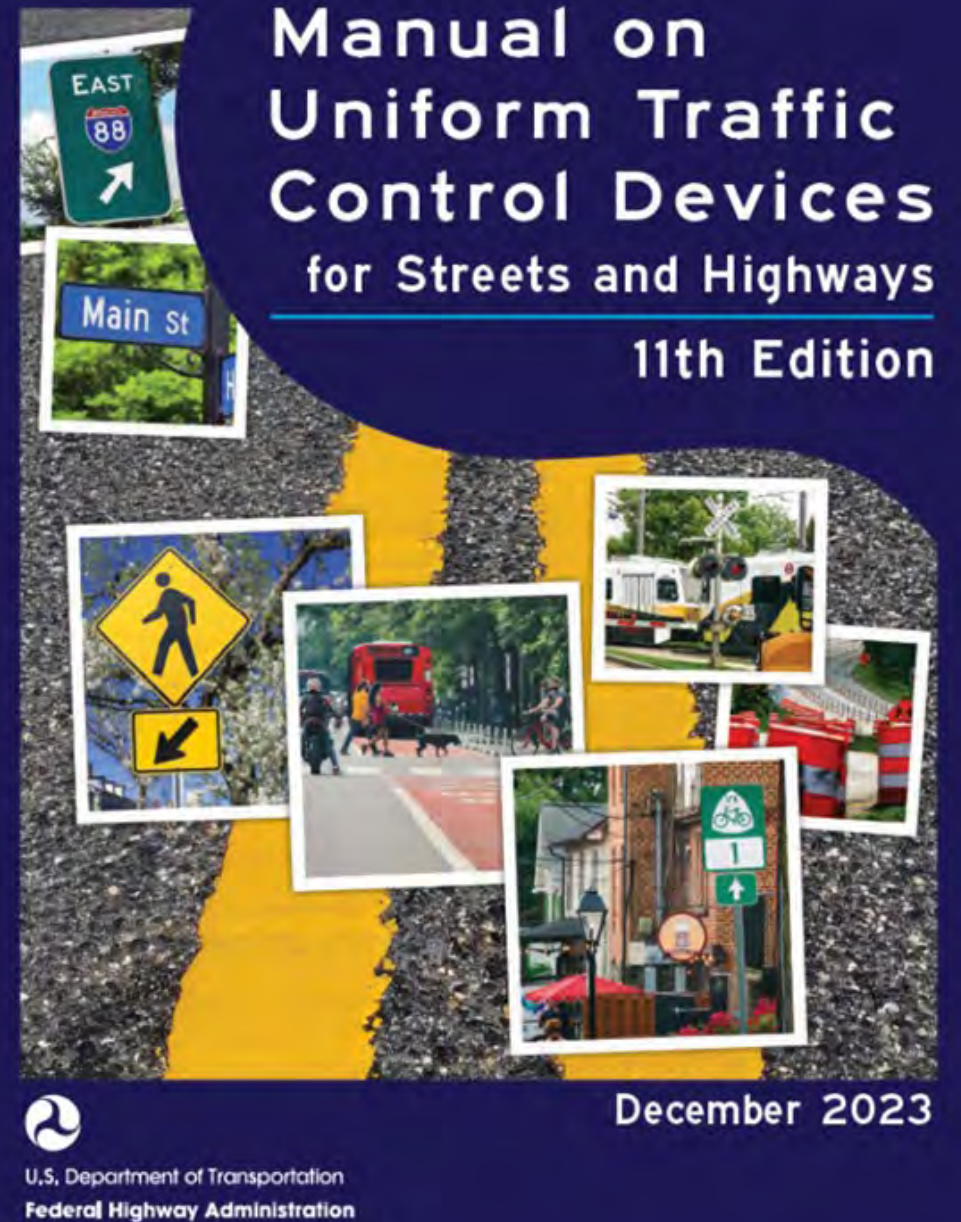
THIS PRESENTATION REPRESENTS THE CURRENT VIEWS, THOUGHTS AND OPINIONS OF THE PRESENTER AND DO NOT NECESSARILY REFLECT THE VIEWS, THOUGHTS AND OPINIONS OF THE EMPLOYER OR OTHER ORGANIZATIONS THAT THE PRESENTER MAY BE AFFILIATED WITH.

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PART 5

TRAFFIC CONTROL DEVICE CONSIDERATIONS FOR AUTOMATED VEHICLES

In December 2023, when the Federal Highway Administration published the final rulemaking for the 11th Edition of the Manual on Uniform Traffic Control Devices (MUTCD), it became the first United States regulatory standards document to provide agencies with guidance on preparing roadway infrastructure for automated vehicles (AV).





MUTCD, 11TH EDITION – PART 5

- (NEW) TITLE: “**Traffic Control Device Considerations for Automated Vehicles (AVs)**”
 - Retitled – Replaces “Part 5, Low-Volume Roads”, the provisions of which have been integrated into other parts of the Manual.
 - PURPOSE: “To **provide agencies with general considerations** for vehicle automation as they assess their infrastructure needs, **prepare their roadways for AV technologies**, and to support (the) safe integration of AVs.”
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MUTCD, 11TH EDITION – PART 5

Chapter 5A General (3 Pages)

SECTIONS

- 5A.01 Scope and Purpose
- 5A.02 Overview of Automated and Connected Vehicles
- 5A.03 Definitions and Terms
- 5A.04 Traffic Control Device and Use Considerations

Chapter 5B. Provisions for Traffic Control Devices (3 Pages)

SECTIONS

- 5B.01 Signs (Part 2)
- 5B.02 Markings (Part 3)
- 5B.03 Highway Traffic Signals (Part 4)
- 5B.04 Temporary Traffic Control (Part 6)
- 5B.05 Traffic Control for Highway-Rail and Highway-Light Rail Transit Grade Crossings (Part 8)
- 5B.06 Traffic Control for Bicycle Facilities (Part 9)

MUTCD, 11TH EDITION – PART 5

SECTION 1C.02 DEFINITIONS OF WORDS AND PHRASES USED IN THIS MANUAL

15. **Automated Vehicle** – see Driving Automation System.

65. **Driving Automation System** – technology that automates some or all aspects of the driving task to assist or replace the human vehicle operator. Section 5A.03 contains descriptions of the automation levels.



MUTCD, 11TH EDITION – PART 5

SECTION 1C.02 DEFINITIONS OF WORDS AND PHRASES USED IN THIS MANUAL

Table 5A-1. Automation Levels

Automation Level	Description	Automation Category	Automation Type
Level 0	The full-time performance by the human driver of all aspects of the Dynamic Driving Task, even when enhanced by warning or momentary intervention systems.	None*	None
Level 1	The driving mode specific execution by a sustained driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the human driver performs all remaining aspects of the Dynamic Driving Task.	Advanced Driver Assistance Systems (ADAS)	Driving Automation System
Level 2	The driving mode specific execution by one or more sustained driver assistance systems of both steering and acceleration/deceleration using information about the driving environment and with the expectation that the human driver performs all remaining aspects of the Dynamic Driving Task.		
Level 3	The driving mode specific sustained performance by an ADS of all aspects of the Dynamic Driving Task within a given ODD with the expectation that the human driver will respond appropriately to a request to intervene.	Automated Driving System (ADS)	
Level 4	The driving mode specific sustained performance by an ADS of all aspects of the Dynamic Driving Task, even if a human driver does not respond appropriately to a request to intervene.		
Level 5	The full-time sustained performance by an ADS of all aspects of the Dynamic Driving Task under all roadway and environmental conditions that can be managed by a human driver.		

*NOTE: Level 0 might include some ADAS features, but they are considered to be warning or momentary intervention systems at this level.

- Advanced Driver Assistance Systems (ADAS)
- Automated Driving System (ADS)
- Automation Levels
- Cooperative Automation
- Driving Automation System
- Dynamic Driving Task (DDT)
- Operation Design Domain (ODD)

MUTCD, 11TH EDITION – PART 5

SECTION 5B.01 SIGNS.

STANDARD:

When scanning graphics (see Section 2A.04) of any type are used on a sign for support of driving automation systems, the scanning graphics shall not be visible to the human eye and the sign shall have no apparent loss of resolution or recognitions for the road user.



Image Source: Connected Wise

GUIDANCE OR CONSIDERATIONS FOR INFRASTRUCTURE TO SUPPORT AUTOMATED VEHICLES

GENERAL GUIDANCE

- **Maintenance Policies and Practices (Condition)** – Adopt practices that consider both human and driving automation systems
- **Uniformity in Application and Location (Consistency)** – Associate device location and message with the specific lane or roadway to which the message applies.

SPECIFIC GUIDANCE (Samples)

- **Markings – 6 Inch Widths, Contrast, and Use of Raised Markers** to supplement not substitute for pavement markings.
- **Signals – Consistent placement of signal faces along a particular corridor, use of a consistent number of signal faces displaying uniform signal indications and clusters for identical or similar situations, use of backplates with retroreflective borders to enhance conspicuity.**

OTHER WORK UNDERWAY

- The SAE ITC VRU Safety Consortium is researching the potential impacts of **LED Flicker** on Machine Vision systems across industry sectors. Use of LEDs and machine vision technologies continues to expand in many sectors, including transportation, manufacturing, quality inspection, astronomy, and more.
- National Cooperative Highway Research Program has projects in development and underway to inform the next update of the AASHTO Geometric Design of Highways and Streets (Greenbook).
- CSA Group is launching a project to develop new Code Documents for 1) Digital Infrastructure, 2) Physical Infrastructure and 3) Cybersecurity, Privacy and Data Management.





THANK YOU

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