



**FEDERAL HIGHWAY ADMINISTRATION
U.S. DEPARTMENT OF TRANSPORTATION
DOCKET # FHWA-2020-0001**

**Notice of Proposed Amendments:
National Standards for Traffic Control Devices**

**SUBMITTED BY:
American Trucking Associations
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The American Trucking Associations (ATA) submits these comments to the Federal Highway Administration (FHWA) in response to the December 2020 notice of proposed amendments¹ to the Manual of Uniform Traffic Control Devices (MUTCD or Manual).

As the national representative of the trucking industry, ATA has a strong interest in matters affecting the safety of our Nation's transportation system, including connected and automated vehicle (AV) technology. Directly and through our affiliated organizations, ATA's united federation of motor carriers and allied members, state trucking associations, and national trucking conferences and councils represent nearly 40,000 industry stakeholders in the United States – encompassing every type and class of motor carrier operation. Our diverse membership also includes original equipment manufacturers, supply chain and logistics companies, infrastructure technology providers, who are all committed to the development of automated driving system (ADS)-equipped commercial motor vehicles (CMVs).

Highways are motor carriers' and drivers' workplaces. Employing more than 7.9 million people and moving nearly 12 billion tons of freight annually, trucking is the industry most responsible for moving America's economy. Every year the trucking industry moves more than 80 percent of our Nation's domestic freight, pays over \$18 billion in federal highway-user taxes,

¹ 85 FR 80898. (Dec. 14, 2020).

and is a critical player in the safety of our Nation's roadways – spending over \$10 billion on safety training, technology, equipment, and management.² As these statistics demonstrate, trucking is an integral component of our Nation's transportation system and economy. The industry has a substantial stake in the success of connected and AV technology, and ATA is committed to supporting these innovative safety goals.

I. Introduction

ATA appreciates FHWA's leadership on ADS and traffic controls. As the NPA shows, the next generation of U.S. roads and highways are likely to leverage many new advanced features – the full safety benefits of which will require fast, interoperable, and constant communication between ADS-equipped vehicles and traffic signals. As the Agency knows, ADS is an enormously complex technology, and while advanced safety features continue to be validated in road tests and laboratory studies, deployment continues to be in an early phase. As the Agency begins work on revising the MUTCD, ATA emphasizes several core principles that FHWA should incorporate into its planning.

Adaptable. ATA recommends the Agency plan for an adaptable approach that accounts for the diverse number of new technologies currently in development and many AVs in operation. At present, ADS-equipped CMVs use a combination of LiDAR, radar, and camera-based technologies to gather data on speed, acceleration, and directionality, among other factors. However, future developments in ADS may be more or less reliant on sensors and instead use any combination of devices with high-definition mapping and cloud-computing software. Most AV technologies are already engaged in mapping exercises of physical infrastructure. These functions may better enable ADS vehicles to perceive the environment around them, control for movements among vehicle systems and subsystems, and plan actions according to this information. The question is not *whether* vehicles will have sensors but how sensors interact with other ADS features. The National Highway Traffic Safety Administration is still determining whether to incorporate the sensing, perceiving, planning, and controlling framework into the Federal Motor Vehicle Safety Standards and how that would be accomplished.³

Preserve Innovative Outcomes. In light of these issues, ATA believes FHWA should make changes to the MUTCD conservatively. Updates to the Manual should preserve the broadest possible range of innovative outcomes while at the same time meeting the needs of AV developers to integrate new technologies on U.S. roadways safely. ATA agrees with USDOT's statement in the *Automated Vehicles Comprehensive Plan* that "*When regulation is needed, the U.S. Government will seek rules, both at home and abroad, which are as performance-based and nonprescriptive as possible.*"⁴ Designing standards for traffic signals, lane markings, and

² ATA. (Aug. 9, 2020). *American Trucking Trends 2020*. Arlington, VA.

³ 85 FR 78058. (Dec. 3, 2020).

⁴ U.S. Department of Transportation. (Jan. 11, 2021). *Automated Vehicles Comprehensive Plan*. Washington, D.C., pg. 4.

road signage to *current* levels of performance is a priority, as well as focusing on future anticipated technology. In either case, it is essential to avoid inadvertently locking AV developers into unnecessary standards. Agreeing on the nature of these standards today thus requires the Agency's cooperation with industry stakeholders on the broad outlines of the proposed changes.

Consider Current Users. ATA believes updates to the Manual should, when possible, conform with the experience of current surface transportation system users. Although ADS technology has made significant progress over the past several years, human operators will continue to be a crucial part of public roads for the foreseeable future. As such, it seems likely that future transportation infrastructure will need to accommodate humans and fully and partially AVs at the same time. Truck drivers, in particular, derive much of their experience through a skilled and highly developed sense of road conditions and traffic signals – so much so that most professional drivers perform complex maneuvers almost intuitively. Physical changes in infrastructure should continue to match the intuition and experience needed to operate the many segments, types, and configurations of commercial vehicle equipment. As such, changes like those proposed in this NPA support our initial understanding of AVs, and provides more learning with road adaptation.

ATA recognizes that modifications to road and highway infrastructure will not occur overnight. Pavement markings and traffic signals are ubiquitous, and the process of modifying them could take place over many years. It is also true that many state and municipal governments require additional road and signaling requirements that go above and beyond the requirements in the MUTCD. As a practical matter, physical lane markings are often highly variable and not always uniform in paint patterns, placement, or coloring. Within an accepted degree of imperfection, differences in this physical infrastructure are tolerated by human drivers who barely notice such differences. ADS provides another technical solution because it can map ideal conditions in place of, or as a supplement to, the physical infrastructure.

ATA believes the inclusion of a *Part 5 Automated Vehicles* in the MUTCD⁵ is an appropriate and needed step for ADS to function properly. It seems appropriate that traffic control devices and road systems should be modified to account for ADS if stakeholders agree that the proposed aspects of the NPA are needed to safely advance ADS-equipped vehicles. ATA generally supports Sections 448-460 of the proposed *Part 5 Automated Vehicles* and provides the following comments to specific proposals outlined in the NPA.

II. Comments on the Proposed New Part 5 Automated Vehicles

Section 454 of the NPA states: *"FHWA proposes to include Support and Guidance statements regarding signs. In the Guidance statement, FHWA recommends that signs be clearly associated to the specific lane/road to which they apply, such as parallel roads with*

⁵ 85 RF 80955-80956.

different speed limits and that information spreading practices be employed to minimize informational load. FHWA also proposes that standard sign designs be retained as much as possible. Finally, FHWA proposes that the illuminated portion of electronic signs should have a standard refresh/flicker rate, greater than 200 Hz. FHWA proposes this language to accommodate machine vision technology, while also helping human drivers."

ATA recommends adding best practices to the maintenance, cleanliness, and routine upkeep of signs in the proposed guidance. Just as standard sign designs should be retained, the viewing capabilities of signs are of equal importance to AVs and human vehicle operators. ATA supports the Agency's role in designing signs for the automotive and trucking industries that are both highly engaged in AV deployment. For example, CMV operations require certain portions of urban, rural, or interstate roads to communicate how truck drivers are directed. The placement of signs should also be evaluated for both humans and AVs to see and interpret them. Certain signs (e.g., highway entry and exit ramps) could be detected to compute a different road speed, which will require signs to be placed in locations that both humans and AV systems know mark specific roads or lanes. Also, AVs may react differently to illuminated signs with periodic warnings (e.g., school zones) or to signs that change throughout the day or in different lighting. Infrastructure power outages should also be considered in guidance for supporting human and AV direction with upgraded signs. These instances should be of focus in such a proposed guidance.

Section 455 of the NPA states: *"FHWA proposes to include Support and Guidance statements with a list of considerations that should be used to accommodate machine vision used to support the automation of vehicles and benefit the performance of the human vehicle operator. Most of these considerations are addressed in more detail in Part 3 and references are provided to the primary Sections. These considerations include uniform line widths, the use of dotted edge line extensions along all entrance and exit ramps, along all auxiliary lanes, and along all tapers where a deceleration or auxiliary lane is added, use of chevron markings in exit gore areas, continuous markings in work zones and in all lane transitions, and minimum dimensions for dashed lines. FHWA also proposes to recommend that raised pavement markers not be used as a substitute for markings and that decorative elements in crosswalks be avoided to minimize any potential confusion for automated systems."*

ATA recommends adding best practices to the maintenance, cleanliness, and routine upkeep of markings in the proposed guidance. Alterations to lanes should be evaluated and tested during work zone events to affirm minimum performance deviation by AVs and human drivers. Although automated cars and trucks are thought to require less lane width given the precision of the onboard technology to steering movement, road lanes should be interchangeable with AVs and human vehicle operators. Random road hazards should be considered in guidance. Deceased animals and left behind objects that are large enough to cover markings for a period of time are unsafe to all road users and should also be considered in guidance.

Section 256 of the NPA states: *“FHWA proposes to include a Guidance statement with a list of considerations that should be used to accommodate machine vision used to support the automation of vehicles and benefit the performance of the human vehicle operator. The list includes consistency along a corridor of traffic signal design and placement with respect to approach lanes, and consistent LED refresh rates greater than 200 Hz. In concert with this change, FHWA proposes a Support statement describing the challenges in achieving corridor-based consistency necessary for machine vision. Information is provided on the benefits of using vehicle-to-infrastructure (V2I) technology for traffic signal systems to address inconsistencies in a corridor.”*

ATA recommends adding best practices to the maintenance, cleanliness, and routine upkeep of highway traffic signals in the proposed guidance. ATA supports the use of vehicle-to-infrastructure (V2I) technology for traffic signal systems. Connected vehicle safety messages can act as critical support for human vehicle operators and AVs, but are not observed as a prerequisite to AVs. Tollbooth systems are one example of how highway traffic signaling can be improved to help traffic flow for human vehicle operators and AVs. Approaching tollbooths usually have good signage and signal systems for speed and direction through lanes, but exiting tollbooths tend to rely on the human operator to return to highway speeds, maneuver the vehicle to a safe driving lane, and prepare for immediate action regarding highway splits and exit ramps. ADS-equipped CMVs are constantly improving their detection systems, mapping, and safety procedures overcoming tollbooth and similar highway traffic signal situations. Achieving corridor-based consistency is most important for the early deployment stages of ADS-equipped CMVs, and ATA stands ready to work with states and FHWA in easing the process for automated truck operations.

Section 458 of the NPA states: *“FHWA proposes a Guidance statement recommending that placement of signs and markings be consistent within a corridor at both passive and active highway-rail grade crossings. In addition, FHWA proposes Guidance recommending that V2I communication be employed at a highway-rail grade crossing. Finally, FHWA proposes a Support statement recommending signs and pavement marking associated with railroad crossings and tracks that are no longer active be removed. FHWA proposes this language to accommodate machine vision better and benefit the performance of the human vehicle operator.”*

ATA recommends adding best practices to the maintenance, cleanliness, and routine upkeep of traffic control for railroad and light rail transit grade crossings in the proposed guidance. ATA echoes the importance of a multi-modal approach to AV truck operations supported by USDOT through several AV activities.⁶ If V2I is to be required for providing safety messages to and from AVs and other surface transportation modes, ATA supports FHWA’s recommendations but not without more research and coordination with AV developers, CMV manufacturers, and the Federal Communications Commission to align standards.

⁶ USDOT. (Jan. 19, 2021). *USDOT Automated Vehicles Activities*. Found at <https://www.transportation.gov/AV>.

III. Additional Recommendations

ATA suggests FHWA incorporate the following considerations into various sections of the Manual:

- A. For roads with concrete pavement (e.g., white, light tan-colored surfaces), road markings should have high contrast with the pavement. On some highways, concrete pavement is marked with white paint such that contrast is poor (for both human and machine drivers), especially in poor weather conditions.
- B. Pavement seams (*i.e.*, tar seams, or concrete seams) may be present at a distance very close to lane markings, making it challenging for ADS to interpret the actual lane markings. Consider mechanisms to decrease the visibility and contrast for pavement seams that do not align with lane boundaries where they cannot be avoided.
- C. The following are recommendations for work zones:
 - 1. It is important to provide as much descriptive detail as possible on work zones, for example, at the scene (infrastructure-based, electronic warning), preemptive routes (roadside units, geofencing, V2X), or via web portal for instantaneous data transfer. All serving greater advanced notice and redundant procedures for traffic and work zone safety.
 - 2. In addition to items in the MUTCD NPA, this could include temporary speed limits, indication of which lanes are free or blocked, and standard signage indicating the start and end of a work zone.
 - 3. ATA appreciates the FHWA's leadership in the Work Zone Data Exchange program.⁷ Rules or guidance to make the creation and upload of work zone configuration data mandatory for states and localities would be extremely helpful to ADS deployment.
- D. Traffic signal heads suspended across an intersection may be subject to movement in high winds, posing challenges to ADS technology in ascribing a particular signal head to a particular lane. Research and guidance to minimize this type of weather condition for signal heads (and possibly signage) would allow for more robust ADS and human operation.
- E. Radar retro-reflective lane markers could be a valuable upgrade to existing lane markings, allowing an AV to be aware of lane configurations at a greater distance. ATA believes these approaches should be further studied for safety and readability by human drivers and ADS.

IV. Comments on the Proposed Amendments to Chapter 2I

⁷ FHWA. (April 9, 2021). *Work Zone Data Exchange (WZDx)*. Found at <https://www.transportation.gov/av/data/wzdx>.

Section 282 of the NPA states: *“FHWA proposes to add a new section numbered and titled, ‘Section 2I.15 Signing for Truck Parking Availability (D9-16b through D9-16e),’ with Option, Standard, Support, and Guidance statements, as well as two new figures, related to the use of Truck Parking Availability General Service signs that may be used to display the number of available truck parking spaces at roadside areas such as rest areas, welcome centers, and weigh stations, and at facilities off a highway that are open to the public and provide parking for commercial vehicles.”*

ATA supports this statement regarding the use of Truck Parking Availability General Service signs. In 2019, the FHWA found that the 98 percent of drivers regularly experience difficulty finding truck parking, and that truck parking is most problematic along key freight corridors, near major ports, around intermodal facilities, and in metropolitan areas.⁸ The standardization of open data specifications for parking spots can help truck drivers better plan their routes and park more efficiently. Also, the adoption of common data standards for truck parking spacing can facilitate truck parking efficiencies for commercial AVs. ATA believes truck parking areas may become important to automated truck operations “hub-to-hub” models, or, AV freight methods where truck parking sites include the “control transfer” of truck driver and AV system. These infrastructure improvements can immediately help truck drivers and (with more collaboration with AV developers and stakeholders) support automated truck operations. In addition, these efforts can be built upon the current Work Zone Data Exchange efforts already underway.

V. Conclusion

ATA appreciates FHWA’s work to update the MUTCD to reflect the latest on ADS technology. We commend the Agency for recognizing the need to create Support and Guidance statements considering all vehicle types and for working with both passenger and commercial vehicle sectors in preparing this updated Manual.

Automated vehicle technology is the next step toward evolving safety technologies improving transportation safety and freight efficiency. The deployment of AV systems is not contingent on DOT implementing these updates and upgrades, but complementary with developers existing efforts. Nevertheless, these early infrastructure investments are critical to help realize the safety benefits of ADS technology sooner rather than later. ATA looks forward to working with the Department on our goals and vision for safety as ADS-equipped CMVs are developed and deployed.

Thank you for the opportunity to submit these comments. If you have any questions, please contact Ross Froat at (703) 838-7980 or rfroat@trucking.org.

⁸ FHWA. (December 1, 2020). *National Coalition on Truck Parking*. Found at https://ops.fhwa.dot.gov/Freight/infrastructure/truck_parking/workinggroups/2020/mtg/mtg12012020.htm.

Sincerely,

A handwritten signature in black ink, reading "Ross Froat". The signature is written in a cursive style with a large, stylized "R" and "F".

Ross Froat
Director of Technology & Engineering Policy
American Trucking Associations