



Comments of the
Motor & Equipment Manufacturers Association
to the
Federal Highway Administration
on the
Proposed Rule; Notice of Proposed Amendments
National Standards for Traffic Control Devices: Manual on Uniform Traffic Control Devices for
Streets and Highways; Revision
Docket No. FHWA-2020-0001; RIN 2125–AF85
May 14, 2021

The Motor & Equipment Manufacturers Association (MEMA) submits the following comments regarding the Federal Highway Administration’s (FHWA) Notice of Proposed Amendments to the Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways.¹

Introduction

MEMA represents more than 1,000 companies that manufacture original equipment (OE) and aftermarket motor vehicle parts, components, systems, and materials for use in passenger vehicles and commercial trucks.² Vehicle suppliers provide 907,000 direct jobs, making it the nation’s largest manufacturing sector with jobs in all 50 states and contributing 2.5 percent of U.S. GDP.³ Our members lead the way in developing advanced technologies that enable safer, smarter, and more efficient vehicles. Vehicle suppliers conceive, design, and manufacture the OE components and systems that make up 77 percent of the value in every vehicle. Additionally, vehicle suppliers manufacture aftermarket parts and materials for the maintenance and repair of 290 million vehicles on the road.

Motor vehicle parts manufacturers are key developers of the components and software for automated driving systems (ADS) that enable highly automated vehicles. Vehicle suppliers have developed a wide range of advanced driver assistance systems (ADAS) technologies, as well as integrated active/passive safety systems that lay the foundation for ADS. Safety data analysis shows that over 36,000 people lost their lives on U.S. roads and over 2.74 million were injured in 2019.⁴ Utilization of automated technology supports the NHTSA mission to save lives, prevent injuries, and reduce the economic costs of vehicle crashes. Widely deployed, automated technologies have the potential to radically improve vehicle safety by reducing fatalities and injuries. On top of saving

¹ 85 Fed. Reg. at 78058

² MEMA represents its member companies through its four divisions: Automotive Aftermarket Suppliers Association (AASA); Heavy Duty Manufacturers Association (HDMA); MERA - The Association for Sustainable Manufacturing; and Original Equipment Suppliers Association (OESA).

³ In addition, direct, indirect, and induced vehicle supplier employment accounts for over 4.8 million U.S. jobs. [U.S. Labor and Economic Impact of Vehicle Supplier Industry](#), MEMA and IHS Markit. February 2021.

⁴ “Traffic Safety Facts: Overview of Motor Vehicle Crashes in 2019,” DOT HS 813 060. U.S. DOT/NHTSA. December 2020.

lives, these technologies can also reduce congestion, improve vehicle fuel efficiency, and enhance personal mobility.

Suppliers are committed to improving vehicle safety and are leading the way in developing the technologies necessary to reduce fatalities and injuries. MEMA is encouraged that FHWA is using the opportunity to revise the MUTCD to prepare for our transportation future by including a new section for automated vehicles under Part 5).⁵ These automated systems are very complex and rely, in part, on well-marked roadways and signs to inform the system about the driving environment. The vehicle industry relies on policy certainty to adequately plan for the safe introduction and long-term deployment of future technologies, like automated technologies. Therefore, MEMA appreciates the FHWA for including Part 5 in a way that enhances the systems' navigation of infrastructure without hindering technology innovation and evolutions.

The following comments from MEMA are focused on the FHWA's proposed Part 5 "Automated Vehicles" of the proposed amendments to the MUTCD. MEMA anticipates some of our member companies may submit even more specific technical feedback relevant to their products. Therefore, the input reflected below represents broad technical approaches and other considerations.

General Comments

By proposing this substantive update, FHWA recognizes the need to modernize and revise the MUTCD to better prepare our nation's traditional infrastructure for an evolving, complex transportation network. As such, MEMA strongly recommends the FHWA complete its review and update of the MUTCD as soon as possible. MEMA further recommends that FHWA consider conducting more frequent updates of the MUTCD more frequently – perhaps a cadence of every two or three years. More frequent updates will enhance the utility of the MUTCD for stakeholders and improve its pace with technologies like advanced driver assistance systems (ADAS) and automated driving systems (ADS) for automated vehicles (AVs).

As these advanced technologies interface with the driving environment, standardization is critical to enhancing the reliability and accuracy of ADAS and ADS. Certainly, standardization of roadway information helps the human driver as well. Standardization also provides a seamless driving environment state-to-state, further reducing system confusion. Ultimately, the goal is the same – to reap the safety benefits of these systems, our nation must employ policies and standards to enhance the systems' effectiveness to avoid/mitigate vehicle crashes and improve mobility.

Section 5A.03 Definitions and Terms

Over the past decade, the evolution in vehicle safety technologies has been incredible. Advanced technologies have foundational, building-block systems upon which the more complex systems are built. As such, standardization of taxonomy and nomenclature is very important. MEMA applauds FHWA for recognizing and referencing the SAE International standard J3016.⁶ Utilizing the appropriate terms and definitions related to varying levels of automated systems in the MUTCD ensures consistency and understanding across different segments of the transportation network as well as across a myriad of federal, state, and local agencies. Given the importance of consistent nomenclature, MEMA recommends that FHWA adhere to and align with the terms and/or definitions delineated in the SAE J3016.

⁵ "Corrected MUTCD Proposed Text," FHWA-2020-0001-0038, Dec. 18, 2020.

⁶ SAE Standard J3016 "Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles," J3016_202104, SAE International.

Section 5B.01 Signs

In general, the consistent characteristics enable will these systems to detect and categorize the information being conveyed by road signs more easily.

- Standard symbols, shapes and colors are critical for rapid system recognition. MEMA members indicated that for camera-based systems, it is critical that the colors specified in the MUTCD by FHWA for regulatory, warning and guide signs are precisely followed. In addition to the importance of color are the shapes of and messages conveyed on signs. Signs that are standard shapes and feature standard symbols and minimum text are preferable. The more uniform a sign's shape, color, and symbols, the easier it will be for these systems to process, interpret and understand the signs.
- MEMA agrees with the FHWA's guidance regarding sign location and application. This is particularly important for complex road environments (*e.g.* multi-lane highways) where dedicated standardized signs directly above the lane, when possible, can enhance the system's sign detection and interpretation. However, for roadways where overhead signage is not an option, the standard sign placement on the right-side of the road is acceptable.
- Many vision cameras used for ADAS / ADS operate with high frame capture rates, which is expected to get even faster in future camera technology. Therefore, with respect to electric-display signs on roadways, MEMA supports the proposed refresh rate of the light-emitting diodes (LEDs) should be more than 200 Hz to enhance a more accurate signal detection. However, as proposed, FHWA has the refresh rate as "guidance." Therefore, MEMA encourages FHWA make this a standard minimum rate by rephrasing as follows: "*The illuminated portion of electronic-display signs using LEDs **should shall** have a standard refresh/flicker rate. The refresh rate of the LEDs **should shall** be greater than 200 Hz to be easier for the camera to detect.*" This simple change will ensure that future electronic signs will adhere to the refresh rate.
- MEMA encourages FHWA to explore additional guidance related to electronic-display signs to equip those signs with vehicle-to-infrastructure (V2I) communication with in-vehicle-information (IVI) messages. These IVI messages can also include infrastructure-to-vehicle (I2V) messages about work zones, road conditions and other critical safety messages as well as signs' GPS coordinates. MEMA suggests that these elements could be considered as part of the reserved section (Part 5C "Future Considerations").

Section 5B.02 Markings

MEMA appreciates the agency's recognition regarding the importance of roadway markings for improved ADAS / ADS detection. Consistency and reliability of markings are important for the ADAS / ADS to operate to its full design potential. These marking characteristics are particularly important in densely populated areas with complex driving environments and a variety of vulnerable road users (*e.g.*, pedestrians, cyclists, scooters).

- Quite simply, the wider the marking the better the detection. Thus, MEMA supports the FHWA proposal to increase longitudinal lines on highways and ramps from 4-inches to at least 6-inches wide and edge lines for roads with posted speed limits of 40 MPH or above to at least 6-inches wide. The wider line markings can extend a system's detection range and provide earlier recognition of curves ahead.

- MEMA supports FHWA's proposed dimensions for lane line gaps of 10-feet by 30-feet or dimensions in the same ratio as appropriate for the relevant traffic speeds and would recommend that the FHWA make this a minimum standard to reduce variations state-to-state.
- Regarding edge line extensions for intersections and interchange ramp areas, MEMA supports the agency's proposal to use a dotted edge line extension for all interchange ramps because these markings may help the system ascertain and identify the vehicle's position in the lane. Not only will these markings help the system, but also human drivers as well.
- Another important line marking characteristic is its contrast to the pavement. Lack of distinctive contrast can particularly be challenging for light-colored pavement and wet surfaces. Other unintentional surface marks, such as skidded tire marks and tar lines used for road repairs and crack sealing, can mimic a road line marking. So having lines with distinct contrast helps the system detect what it "sees." For markings distinguished by white and/or yellow lines, the contrast in the so-called "Oreo" marking pattern (line sandwiched by black lines for contrast) does aid in ADAS and ADS detection. There are also benefits to the contrast of the "lead-lag" pattern (line followed by a black line in equal lengths).
- Also presenting challenges for ADAS / ADS system detection are raised pavement markers (*e.g.*, "Botts Dots"). By themselves, these markers are difficult for the systems to detect and interpret. While MEMA appreciates that FHWA recognizes that these markers should be accompanied by (and not in lieu of) the corresponding lane markings, MEMA recommends that FHWA discourage the use of Botts Dots.
- The crash data show that crashes involving pedestrians (and other non-occupants) have increased.⁷ There has also been a trend, in some locations, to use crosswalks (as well as entire intersections) to display artistic murals. These unique markings may impede or interfere with a system's ability to detect standard road and infrastructure markings. MEMA applauds the agency for recognizing the importance of highly visible crosswalks as defined in the MUTCD under Part 3C. As such, MEMA supports FHWA's proposed guidance indicating the "avoidance of decorative elements in crosswalks" and would further encourage FHWA to actively discourage the incorporation of unique designs on the road surface at intersections and crosswalks. MEMA also recommends the FHWA encourage the use of the "Zebra" pattern. This pattern not only aids in system detection, but also enhances the visibility for human drivers and pedestrians.

Section 5B.03 Highway Traffic Signals

FHWA recognizes the benefit of improving the uniformity of traffic signals to improve detection for both system operators and human drivers.

- Under the signs section, MEMA noted that cameras on ADAS / ADS use cameras with high-frame capture rates. Therefore, we support the proposed LED refresh rate for traffic signals to be 200 Hz or more to enable system detection.

⁷ "The biggest change is in nonoccupant fatalities, as a proportion of overall traffic fatalities, increasing from 15 percent in 2010 to 20 percent in 2019." Traffic Safety Facts: "Overview of Motor Vehicle Crashes in 2019," NHTSA, DOT HS 813 060, December 2020.

- MEMA further recommends the utilization of retroreflective edges around signals to enhance the system (and human) detection of the signal, particularly during inclement weather, sun glare or night-time conditions.

Section 5B.04 Temporary Traffic Control

Work zones present challenges because of the wide range of variability in driving environments under construction. MEMA appreciates FHWA for recognizing the need to address ways to accommodate and enhance performance of ADAS / ADS in work zones.

- MEMA agrees with the guidance proposed that construction channelizing devices should be at least 8-inches wide with retroreflective material. That said, MEMA notes that these systems can more easily detect 18-inch barrels at longer distances, which can enhance the system's application and operation in those work zone environments.

Section 5B.05 Railroad Crossings

According to the Federal Railroad Administration, from 2017 to 2020 there were a total of 7,227 reported highway-rail crossing incidents (at public crossings).⁸ Accidents at crossings are devastating and preventable with improved and standardized signs, signals, and markings.

- MEMA applauds FHWA for noting the need for consistency at both active and passive crossings to promote uniformity for systems to properly detect them. We also agree with the FHWA proposed guidance to remove signs and markings from inactive railroad track crossings to avoid confusion for both systems and human drivers.
- For future considerations under Section 5C, MEMA believes that railway crossings also present an opportunity for infrastructure communication messages to vehicles regarding oncoming trains and related crossing status information.

Section 5B.06 Traffic Control for Bicycle Facilities

Separate lanes for bicycles are there to improve cyclists' safety and reduce interaction with vehicles in operation. The lane markings and bicycles can be detected by machine vision systems. However, these systems (and humans) face challenges when a cyclist abruptly leaves the dedicated bike lane intruding on the vehicle's lane of travel. Standardizing bike lane markings and other lane controls will not only be safer for the cyclist, but also enhance the system/human ability to better detect them in the driving environment.

Section 5C Future Considerations (Reserved)

MEMA applauds the FHWA for including Sections 5A and 5B in its proposal. Indeed, the ongoing innovations and evolutions of ADAS- and ADS-equipped vehicles necessitate the need for future considerations. These advanced technologies can save lives.

Under our comments to Part 5B.01, MEMA cited an example of a candidate topic for future considerations. Enhancing vehicle communications with infrastructure information would benefit from MUTCD guidance related to electronic-display signs and equipping them with vehicle-to-infrastructure (V2I) communication with in-vehicle-information (IVI) messages.

MEMA encourages FHWA to continue to consult with industry stakeholders and engage in more public consultations to address future needs and identify opportunities for standardization and/or

⁸ 2017-2020 data of Public Crossings from the table "Total Highway-Rail Crossing Incidents by State," Office of Safety Analysis, Federal Railroad Administration.

harmonization. Thus, MEMA reiterates the recommendation to conduct more frequent reviews of and updates to the MUTCD.

Conclusion

MEMA appreciates the opportunity to present these comments for FHWA's consideration. We look forward to an ongoing dialogue between the agency and our members and can serve as a resource. Overall, the proposed guidance sets the right pathway to ensuring consistency. Our nation's roadway network is complex; improving the uniformity of traffic control devices for ADAS / ADS is a critical need to ensure that these systems can operate at their full design potential.

For any questions or more information, please contact Leigh Merino, MEMA vice president of regulatory affairs at lmerino@mema.org.

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