



DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Parts 571

[Docket No. NHTSA-2023-0021]

RIN 2127-AM37

Federal Motor Vehicle Safety Standards;

Automatic Emergency Braking Systems for Light Vehicles

AGENCY: National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT).

ACTION: Final rule; response to petitions for reconsideration.

SUMMARY: This document grants parts of petitions for reconsideration of a May 9, 2024, final rule that adopted Federal Motor Vehicle Safety Standard (FMVSS) No. 127, “Automatic Emergency Braking for Light Vehicles,” which requires automatic emergency braking (AEB), pedestrian automatic emergency braking (PAEB), and forward collision warning (FCW) systems on all new light vehicles. This final rule clarifies requirements applicable to FCW visual signals and audio signals, corrects an error in the test scenario for obstructed pedestrian crossing the road, and removes superfluous language from the performance test requirement for lead vehicle AEB. This notice denies other requests in the petitions. This document also denies a petition for reconsideration, which is treated as a petition for rulemaking because it was received more than 45 days after publication of the rule.

DATES: *Effective* [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

Compliance date: Compliance with FMVSS No. 127 and related regulations, as amended in this rule, is required for all vehicles by September 1, 2029. However, vehicles produced by

small-volume manufacturers, final-stage manufacturers, and alterers must be equipped with a compliant AEB system by September 1, 2030.

Petitions for reconsideration: Petitions for reconsideration of this final action must be received not later than **[INSERT DATE 45 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER]**.

ADDRESSES: Correspondence related to this rule, including petitions for reconsideration and comments, should refer to the docket number set forth above (NHTSA-2023-0021) and be submitted to the Administrator, National Highway Traffic Safety Administration, 1200 New Jersey Avenue, S.E., Washington, D.C. 20590.

FOR FURTHER INFORMATION CONTACT: For technical issues: Mr. Markus Price, Office of Crash Avoidance Standards, Telephone: (202) 366-1810, Facsimile: (202) 366-7002. For legal issues: Mr. Eli Wachtel, Office of the Chief Counsel, Telephone: (202) 366-2992, Facsimile: (202) 366-3820. The mailing address for these officials is: National Highway Traffic Safety Administration, 1200 New Jersey Avenue, S.E. Washington, DC 20590.

SUPPLEMENTARY INFORMATION:

Table of Contents

- I. Background and Executive Summary
- II. Petitions for Reconsideration Received by NHTSA and Analysis
 - A. No Contact
 - B. Multiple Trials
 - C. Equipment Requirement
 - D. Unlimited Preconditioning and Test Runs
 - E. Malfunction Indicator Lamp
 - F. Deactivation
 - G. Obstructed Pedestrian Crossing Test Correction
 - H. FCW Auditory Signal
 - I. FCW Visual Signal
 - J. Cost Estimates
 - K. Brake Pedal Robot
 - L. Manual Transmission
 - M. Small-Volume Manufacturers
- III. Petition for Rulemaking Received by NHTSA and Analysis
 - A. Include V2X
- IV. Rulemaking Analyses and Notices
- V. Regulatory Text

I. Background and Executive Summary

In November 2021, the Bipartisan Infrastructure Law (BIL), enacted as the Infrastructure Investment and Jobs Act (Pub. L. 117-58), was signed into law. BIL directed the Secretary of Transportation to promulgate a rule to establish minimum performance standards with respect to crash avoidance technology and to require that all passenger motor vehicles manufactured for sale in the United States be equipped with forward collision warning (FCW) and automatic emergency braking (AEB) systems that alert the driver if a collision is imminent and automatically apply the brakes if the driver fails to do so.

In accordance with BIL, NHTSA issued a Notice of Proposed Rulemaking (NPRM) (88 FR 38632) in June 2023, followed by a final rule (89 FR 39686) in May 2024, establishing FMVSS No. 127, “Automatic Emergency Braking Systems for Light Vehicles.” This FMVSS requires AEB, including pedestrian AEB (PAEB), systems on light vehicles. In addition to the mandate in BIL, the final rule was also issued under the authority of the National Traffic and Motor Vehicle Safety Act of 1966 (Safety Act). Under 49 U.S.C. chapter 301, the Secretary of Transportation is responsible for prescribing motor vehicle safety standards that are practicable, meet the need for motor vehicle safety, and are stated in objective terms. The responsibility for promulgation of FMVSSs is delegated to NHTSA.

The final rule includes four requirements for AEB systems for both lead vehicles and pedestrians. First, there is an equipment requirement that vehicles have an FCW system that provides an auditory and visual signal to the driver of an impending collision with a lead vehicle or a pedestrian. The system must operate at any forward speed greater than 10 km/h (6.2 mph) and less than 145 km/h (90.1 mph) for a warning involving a lead vehicle, at any forward speed greater than 10 km/h (6.2 mph) and less than 73 km/h (45.3 mph) for a warning involving a pedestrian. Similarly, the final rule includes an equipment requirement that light vehicles have an AEB system that applies the brakes automatically when a collision with a lead vehicle or pedestrian is imminent. The system must operate at any forward speed that is greater than 10

km/h (6.2 mph) and less than 145 km/h (90.1 mph) for AEB involving a lead vehicle, and at any forward speed greater than 10 km/h (6.2 mph) and less than 73 km/h (45.3 mph) for PAEB.

Second, the AEB system is required to prevent the vehicle from colliding with the lead vehicle or pedestrian test devices when tested according to the standard's test procedures. These track test procedures have defined parameters, including travel speeds up to 100 km/h (62.2 mph), that ensure that AEB systems prevent crashes in a controlled testing environment.

Third, the final rule includes two false activation tests.

Finally, the final rule requires that a vehicle must detect AEB system malfunctions, including performance degradation caused solely by sensor obstructions, and notify the driver of any malfunction that causes the AEB system not to meet the minimum proposed performance requirements. If the system detects a malfunction, or if the system adjusts its performance such that it will not meet the requirements of the finalized standard, the system must provide the vehicle operator with a telltale notification.

The final rule applies to vehicles manufactured on or after September 1, 2029. An additional year is provided for small-volume manufacturers.

Petitions for Reconsideration Received

NHTSA regulations allow any interested person to petition the Administrator for reconsideration of a rule. Under NHTSA's regulations, petitions for reconsideration must provide an explanation why compliance with the rule is not practicable, is unreasonable, or is not in the public interest. Additionally, petitions must be received within 45 days of the publication of the final rule. Untimely petitions for reconsideration are considered to be petitions for rulemaking. The Administrator may consolidate petitions relating to the same rule.¹

NHTSA received petitions for reconsideration from the Alliance for Automotive Innovation (the Alliance),² Toyota Motor North America (Toyota),³ Volkswagen Group of

¹ 49 CFR 553.35, 553.37.

² Alliance for Automotive Innovation, Docket No. NHTSA-2023-0021-1071.

³ Toyota Motor North America, Docket No. NHTSA-2023-0021-1074.

America (Volkswagen),⁴ and Scuderia Cameron Glickenhaus, LLC (Glickenhaus).⁵ NHTSA also received a letter from Hyundai Motor Group (Hyundai), styled as a “supplemental comment,” that provides its perspective on FMVSS No. 127, which we have considered in this response to the petitions for reconsideration.⁶ NHTSA also received a petition from Autotalks that NHTSA is treating as a petition for rulemaking because it was received more than 45 days after publication of the final rule.⁷ The petitions requested a variety of amendments to FMVSS No. 127. These, and NHTSA’s reasoning and response to each petitioned-for item, are summarized below and discussed in detail in the respective sections of the preamble of this notice.

Summary of Responses to the Petitions for Reconsideration

In response to these petitions, NHTSA is granting in part and denying in part. The changes made to FMVSS No. 127 are summarized as follows.

- FMVSS No. 127 contains an equipment requirement that AEB systems activate the service brakes when a collision is imminent and that they operate under certain conditions. It also contains a performance test requirement for lead vehicle AEB that contains similar language. Petitioners requested definitions for the terms “operate” and “imminent.” NHTSA is amending the language in the performance test requirement to remove reference to “imminent” from the performance test requirement for lead vehicle AEB, to clarify that the performance test does not evaluate AEB activation timing. NHTSA is not providing a definition for “operate” because the definition of “automatic emergency braking system” in the final rule sufficiently describes how an AEB system operates. NHTSA is not providing a definition for “imminent” because the term is used consistent with its plain meaning.

⁴ Volkswagen Group of America, Docket No. NHTSA-2023-0021-1073.

⁵ Scuderia Cameron Glickenhaus, Docket No. NHTSA-2023-0021-1078.

⁶ Hyundai Motor Group, Docket No. NHTSA-2023-0021-1072.

⁷ Autotalks, Docket No. NHTSA-2023-0021-1075.

- FMVSS No. 127 contains a test scenario that, when tested with very narrow vehicles at the extreme of the tolerances allowed by the test condition, resulted in a stringency beyond that intended by NHTSA. This final rule amends the test scenario to ensure the correct level of stringency.
- FMVSS No. 127 contains specifications for the FCW visual signal location. Petitioners requested additional clarity. This final rule amends the regulatory text to clarify these specifications.
- FMVSS No. 127 contains requirements for the FCW audio signal, including that in-vehicle audio must be suppressed when the FCW auditory signal is presented. Petitioners expressed several concerns about the clarity and objectivity of these requirements as well as test conditions. This final rule clarifies these requirements by stating the location of the microphone, additional vehicle conditions under which testing will occur, and amending the definitions to simplify the requirement for suppression.

This rule also denies the petitions with regards to several other requested amendments. These are as follows. For the items for which petitioners restate arguments made during the comment period for FMVSS No. 127, the reasons given for denial are the same as those stated in the final rule.

- The performance requirement for both lead vehicle and pedestrian AEB testing is collision avoidance (referred to throughout the final rule and this document as “no contact”). Petitioners requested relaxation of this requirement to allow contact at low speeds, specifically requesting 10 km/h (6.2 mph). NHTSA is rejecting this request because the no contact requirement is practicable and meets the need for safety.
- Petitioners requested that multiple test runs be allowed to achieve the no contact performance requirement (for example, that vehicles must pass on 5 out of 7 test runs) to account for variability. Petitioners noted that FMVSS No. 135, which regulates light

vehicle brake systems, allows multiple test runs to meet some of the performance requirements. NHTSA is rejecting this request because FMVSS No. 127 testing is distinct from FMVSS No. 135 testing such that not allowing multiple test runs in FMVSS No. 127 is practicable and meets the need for safety.

- FMVSS No. 127 test scenarios state that the vehicle can be driven for any amount of time. Additionally, it does not place a cap on the number of tests that could be run on any given subject vehicle. Petitioners expressed concern that this standard would allow excessive driving or testing of vehicles to wear out components such that they can no longer meet the performance required by the standard. NHTSA finds further specification is unnecessary because the test does not evaluate the endurance or durability of wear parts and will not be used in such a manner.
- FMVSS No. 127 requires that vehicles illuminate a malfunction identification lamp (MIL) upon detection of a malfunction or if the AEB system adjusts its performance such that it is below the performance required by the standard. Petitioners requested additional specificity regarding the terminology in this requirement as well as a test procedure. NHTSA is rejecting this request because the requirement meets the Safety Act as written.
- FMVSS No. 127 does not permit installation of a manual control with the sole purpose of deactivating the AEB system. It does contain a provision allowing automatic deactivation in certain situations. Petitioners requested permission to install a manual deactivation control, as well as modifications to the automatic deactivation provision. NHTSA is rejecting this request because the final rule already addresses petitioners' concerns.
- Petitioners stated that NHTSA did not fully consider costs associated with compliance. No change is needed in response to this request because the final rule fully considered the costs associated with compliance.

- Volkswagen requested additional specifications for the brake pedal robot used in testing with manual brake application. NHTSA is rejecting this request for the reasons stated in the May 9, 2024 final rule.
- Petitioner Glickenhause requested the AEB requirements not be applicable to vehicles with manual transmission. NHTSA is rejecting this request because vehicles equipped with manual transmissions and AEB are widely available.
- Petitioner Glickenhause requested additional flexibility for very small volume manufacturers. NHTSA is rejecting this request because AEB systems are available for purchase and, in the case that a manufacturer is unable to acquire systems, the exemption processes in the Safety Act may provide relief.

II. Petitions for Reconsideration Received by NHTSA and Analysis

A. No Contact

The final rule requires that, when tested according to the procedures therein, the subject vehicle not collide with the test device (vehicle test device or pedestrian mannequin). The test data, discussed at length in the final rule, demonstrates that this requirement is practicable. A tested vehicle was able to meet the performance requirements in the final rule and recent NHTSA testing revealed significant improvement throughout much of the fleet in a relatively short time. These facts show that compliance by 2029 is practicable.

In the final rule we also emphasized that practicability must be viewed from the perspective that under the Safety Act, NHTSA has the authority to issue standards that are technology-forcing.⁸ That is, NHTSA is empowered under the Safety Act to issue safety standards that “impel automobile manufacturers to develop and apply new technology to the task of improving the safety design of automobiles as readily as possible” such that they “require improvements in existing technology or which require the development of new technology, and

⁸ *Chrysler Corp. v. Dep't of Transp.*, 472 F.2d 659 (6th Cir. 1972) (*Chrysler*).

is not limited to issuing standards based solely on devices already fully developed.”⁹ NHTSA acknowledged that the final rule is technology-forcing, but emphasized that the standard is practicable and no single current vehicle must meet every requirement for an FMVSS to be considered practicable under the Safety Act.

Petitioners requested reconsideration on two broad grounds: first that the no-contact requirement is not practicable, and second that it does not meet the need for safety.

1. Practicability and Test Data

a. PAEB and AEB Test Data

The Alliance stated that NHTSA has not demonstrated that the no contact requirement is practicable for the fleet. Other than the simulation data for the obstructed pedestrian crossing road scenario, the Alliance did not present any new data or analysis regarding the practicability of requiring collision avoidance in AEB compliance testing that the agency had not previously considered.¹⁰ The Alliance noted that the final rule states that NHTSA agrees with the IIHS’s comment to the NPRM that some current AEB systems are already completely avoiding collisions under the proposed AEB testing. The Alliance added, however, that IIHS did not test any vehicles at speeds faster than 70 km/h (43.5 mph), and only three out of the six tested vehicles could avoid the lead vehicle target in all of the test runs. It also stated that NHTSA conceded that no vehicle in its 2020 AEB research was able to meet all the performance requirements of the final rule for lead vehicle and PAEB systems. It also pointed out that for lead vehicle AEB systems, NHTSA’s MY 2023 research showed that only one vehicle could avoid contact in each test speed and scenario, but even that vehicle did not avoid contact on every test run at the most stringent condition. The Alliance argued that a single vehicle’s ability to meet the required tests some of the time does not support NHTSA’s conclusion that the no-contact requirement is practicable. The Alliance also stated that the vehicles used in NHTSA’s 2023

⁹ *Id.* at 671, 673.

¹⁰ The obstructed pedestrian crossing road scenario is discussed in detail in Section II.G, “Obstructed Pedestrian Crossing Test Correction,” of this notice.

testing don't support the final rule because those vehicles were designed only to meet the performance levels stated in the 2016 voluntary commitment.¹¹

The Alliance stated the agency's analysis of test data demonstrate variation in performance that was not accounted for in the final rule. The Alliance stated that the final rule did not consider whether variability between vehicles or testing locations would make compliance more challenging by dictating the design margin that manufacturers need to meet to comply with the requirement. The Alliance reasoned that NHTSA's evaluation (in the FRIA) of the variability in time-to-collision (TTC) at brake activation demonstrates that this variability is meaningful and demonstrates variation in performance. The Alliance noted that NHTSA research that was conducted with three vehicles at the speed range from 16 km/h (9.9 mph) to 40 km/h (24.9 mph) showed a variation of at least 0.15 seconds in TTC at brake activation.

Agency Analysis

The test data demonstrates that the rule is practicable. In its petition, the Alliance acknowledged that NHTSA had considered all available information and test results from the agency's research and studies conducted by stakeholders such as IIHS. It also acknowledged that a tested vehicle was able to meet the performance requirements, despite not being designed to meet the requirements of the final rule. Additionally, the vehicle that was able to meet the requirements had a sales price below the market average, indicating that the requirements could be met without expensive new technologies.

NHTSA's recent testing also marked significant progress compared to its earlier research from 2020. The positive trend in AEB technology was further supported by IIHS, which highlighted substantial improvements between the 2023 and 2024 model years in the stationary lead vehicle test at 70 km/h (43.5 mph).¹² Notably, the percentage of vehicles avoiding the target

¹¹ In March 2016, NHTSA and the Insurance Institute for Highway Safety (IIHS) announced a commitment by 20 manufacturers representing more than 99 percent of the U.S. light vehicle market to include low-speed AEB as a standard feature on nearly all new light vehicles not later than September 1, 2022. As part of this voluntary commitment, manufacturers are including both FCW and a crash imminent braking (CIB) system that reduces a vehicle's speed in certain rear-end crash-imminent test conditions.

¹² NHTSA-2023-0021-1076.

in all test runs increased from 10 percent to 56 percent. These data all show that meeting the requirements of this rule by September 2029 is practicable.¹³

Additionally, the Alliance's framing of vehicle and test location variability and our FRIA estimates is unconvincing. Variability between vehicles in the same model line and year (vehicle-to-vehicle variability) is determined by the manufacturer, subject to the requirement that every vehicle it sells meet the minimum safety performance. NHTSA has no reason to believe that the vehicles we tested had superior performance to other vehicles in the same model line and year. Also, vehicle-to-vehicle variability is a consideration for all FMVSS, and the Alliance provided no information to indicate that there is an issue unique to AEB. Additionally, variation in brake activation timing between manufacturers is contemplated by the structure of the rule. The final rule does not dictate brake activation timing, brake force, or any other aspects of AEB performance other than that the subject vehicle not make contact with the test device.

Regarding variability across test locations, FMVSS No. 127 specifies all the needed conditions to inform manufacturers of how we will test. These conditions were proposed in the NPRM, and commenters did not raise conditions that were not included that would affect test outcomes. Finally, the variability analysis in the FRIA is our attempt to connect the idealized test conditions to the real world when conducting benefits analyses. NHTSA understands that in the real world there will be variability that cannot be tested in an efficient way through an FMVSS, which informs our benefits calculations. However, such analysis should not be used to determine the types of results achievable in an idealized testing environment. For these reasons, NHTSA will not grant reconsideration.

b. FMVSS No. 135 Test Data

The Alliance stated that the final rule improperly relied on the agency's evaluation of FMVSS No. 135 test results, which showed that braking performance of nearly all tested

¹³ Additionally, in the final rule we emphasized several other reasons that inform the practicability of selecting a no contact requirement over a requirement that allows contacts, such as testing repeatability and costs associated with replacing or repairing test vehicles and test devices.

vehicles was much better than what the FMVSS requires. The Alliance stated that the evaluation reflects that manufacturers build compliance margins into their design for FMVSS compliance and does not support the agency's conclusion that the no-contact requirement is practicable. Furthermore, the Alliance stated that test results from FMVSS No. 135 testing are not comparable to AEB performance because the final rule requires performance from both the service brakes and a perception system, whereas FMVSS No. 135 evaluates only service brake performance. Also, the Alliance stated that the maneuvers in FMVSS No. 135 tests are conducted with a human driver putting muscular effort into the brake pedal. In contrast, there is no human input when testing the AEB system.

Agency Analysis

NHTSA's use of FMVSS No. 135 test results was justified. As an initial matter, those results were not the primary results upon which the agency determined that the requirements are practicable. They were used largely to show that the braking performance needed to meet the requirements in the final rule is present in the current fleet without the need for changes, especially with regard to heavier vehicles for which there were limitations on available test data. The results indicated that the brake performance of most vehicles surpasses the performance requirements set by FMVSS No. 135. While the results of these tests might not show exactly how the braking systems will perform under automatic actuation that does not involve human muscular inputs, they do demonstrate that braking performance is more than sufficient to permit compliance with the final rule. Indeed, we do not need to rely on FMVSS No. 135 test data to demonstrate actuation performance because AEB systems currently on the road and tested by NHTSA actuate the service brakes without human driver inputs and demonstrate the performance needed to meet FMVSS No. 127. Therefore, we disagree with the Alliance's contention that the final rule misused the FMVSS No. 135 test results.

c. Test Speeds and Headway

Toyota, Volkswagen, and the Alliance expressed concern regarding the practicability of high maximum test speeds and no contact. The Alliance stated that NHTSA's data illustrate the difficulties in complying with the decelerating lead vehicle test with both the lead and subject vehicles traveling at 50 mph (80 km/h) at any headway between 12 and 40 meters (S7.5.1(a), S7.5.2(b)(2), S7.5.3(a) and S7.5.3(d) of the final rule). To address this issue, the Alliance petitioned NHTSA to consider reducing the maximum test speed for the AEB and PAEB requirements and adjust the headway requirements. The Alliance claimed that the 2023 additional AEB research in the final rule evaluated only the test condition with a 12-meter headway and did not provide any test data to support the lead vehicle decelerating test with headways greater than 12 meters.

Agency Analysis

NHTSA is not reducing the maximum test speeds or adjusting the headway requirements for the test scenarios. Petitioners' requests for test speed reduction were addressed in the final rule, and headways above 12 meters are practicable.

Regarding test speeds, NHTSA's 2023 research showed multiple vehicles avoided contact on most tests regardless of scenario and test speed.¹⁴ Further, one vehicle avoided contact on all lead vehicle AEB and PAEB tests except on three of the five lead vehicle decelerating tests, where it impacted the lead vehicle at approximately 5 km/h or less.¹⁵ That vehicles not designed to meet the standard are already capable of doing so demonstrates that the performance test requirements are practicable.

Regarding headway for the lead vehicle decelerating test, the headway ranges selected are consistent with those used by Euro NCAP and NHTSA incorporated the test ranges for speed and headways to ensure AEB system robustness under a range of situations. NHTSA tested 2022

¹⁴ NHTSA's 2023 Light Vehicle Automatic Emergency Braking Research Test Summary, Docket No. NHTSA-2023-0021-1066; NHTSA's 2023 Light Vehicle Pedestrian Automatic Emergency Braking Research Test Summary, Docket No. NHTSA-2023-0021-1068.

¹⁵ The low impact speeds on the system that did not avoid contact on all trials suggests that slight tuning of that AEB to the requirements of FMVSS No. 127 is needed to meet the standard.

model year vehicles with headways of 40 m with and without manual brake application at 50 km/h and 80 km/h, and with a lead vehicle deceleration of 0.4 g and 0.5 g.¹⁶ During that testing, multiple vehicles avoided contact in almost all lead vehicle decelerating test scenarios and one vehicle avoided contact in all scenarios. Additionally, the shorter headway tests are generally more stringent than tests with larger headways. In our 2023 testing, one vehicle tested by NHTSA avoided contact in the 80 km/h lead vehicle deceleration test in all trials with a 12 m headway, and another vehicle avoided contact on 2 out of 5 runs,¹⁷ suggesting that avoiding contact under less stringent test conditions is practicable. Based on our test data, the requirements are practicable and will not be adjusted.

2. Meet the Need for Safety

Petitioners requested reconsideration of the no contact requirement, stating that it could lead to unintended consequences such as increased false positives and a rise in rear-end collisions. A false positive describes AEB system brake applications in circumstances where there is no crash-imminent situation, such as braking in the absence of a true obstacle.

a. Sufficiency of Analysis of False Positives

The Alliance stated that NHTSA has not adequately considered whether meeting the no-contact performance requirement will generate false positives and that NHTSA “should have attempted to quantify this risk” and assessed why those disbenefits are reasonable to accept. The Alliance suggested that a false positive in FMVSS-compliant AEB vehicles could induce rear-end collisions with vehicles that are not equipped with rule-compliant AEB systems. The Alliance’s petition included simulation data indicating that a vehicle complying with the final rule must respond within 0.35 seconds to avoid contact in one of the obstructed pedestrian crossing situations, which it argues is beyond the reaction ability of human drivers that may be

¹⁶ NHTSA’s 2022 Light Vehicle Automatic Emergency Braking Research Test Summary, Docket No. NHTSA-2023-0021-0005.

¹⁷ NHTSA’s 2023 Light Vehicle Automatic Emergency Braking Research Test Summary, Docket No. NHTSA-2023-0021-1066.

behind these vehicles. It claimed that this discrepancy will likely result in a rear-end crash. Furthermore, according to the Alliance, increases in relative speed may heighten the likelihood of false positives due to the need for earlier prediction and intervention. The Alliance stated that NHTSA acknowledged that false positives could generate problems with public acceptance of AEB technology. It also stated that NHTSA dismissed this concern in the final rule without demonstrating that the final rule's requirements will not significantly impact the rate of false positives, and without understanding that the final rule demands effectively different systems from those currently installed in vehicles. The Alliance did not suggest any specific alternative.

Toyota claimed that the requirements in the final rule will likely lead to an increase in false positives and can create driving behavior that neither the driver of the subject vehicle nor the drivers of surrounding vehicles will find natural or predictable, resulting in safety disbenefits. It stated that due to high maximum testable speeds, AEB will need to activate earlier to avoid a collision, and while a system can be designed to better account for curves in the road or parked cars, systems cannot be designed to predict what drivers in lead vehicles intend to do. Regarding PAEB, Volkswagen claimed that because pedestrians may change their travel path to avoid a collision themselves, AEB activations that initiate early to avoid a potential collision will result in rear end collisions with the stopping vehicle.

Agency Response

Petitioners' statements were largely speculative. In support of these arguments, they did not present any new data or analysis beyond what the agency had already considered.¹⁸ Petitioners have failed to provide data demonstrating the likelihood of an increase in false positives or the magnitude of the increase, nor is NHTSA aware of any source of such data.

Under the Administrative Procedure Act (APA) and the Safety Act, NHTSA's obligation is not to eliminate uncertainty. Courts have repeatedly emphasized that the agency's job is to acknowledge uncertainty, explain the available evidence, and offer a "rational connection

¹⁸ Petitioner's simulation data provided regarding the obstructed pedestrian crossing test is discussed in Section G.

between the facts found and the choice made.”¹⁹ In coming to its determination, NHTSA dealt with each of the principal uncertainties and resolved them to the degree possible. In some cases, the requisite decisions were necessarily based on imperfect data and were inherently judgmental or predictive in part. The obligation to make such decisions and resolve such uncertainties is an integral part of NHTSA’s mandate under the Safety Act and the APA. Our determination under the Safety Act, which was based on several factors including the available test data, was that collision avoidance was practicable and that any risk of increased false positives and rear collisions did not outweigh the benefits of the rule. Therefore, considering the data available and applying our expert judgment about the unquantifiable aspects of the rule, we selected the option that best meets the need for safety.

NHTSA acknowledged the uncertainties and explained our reasoning throughout the rulemaking effort. In the FRIA, we noted that there is insufficient data to quantify the frequency and dynamics of false positive scenarios.²⁰ We explained that the analysis had limitations regarding crash scenarios and parameters beyond those reflected in testing. We recognized from our testing that performance is variable and false positives do occur on current systems. However, this uncertainty, on its own, does not demonstrate that false positives would become more frequent under the final rule.

We also explained that it is not possible to anticipate an exhaustive list of other possible real-world scenarios that systems would face and continually repeat testing to establish a robust estimate of the frequency of false positive occurrence. Based on this reasoning and test results, the analysis in the FRIA considered false positive rates to be the same under the final rule as they are in the current fleet. These false positives are therefore included in the analysis, but do not

¹⁹ In *Motor Vehicle Mfrs. Assn. of United States, Inc. v. State Farm Mut. Automobile Ins. Co.*, 463 U.S. 29, 51-52 (1983), the Court recognized that “[i]t is not infrequent that the available data does not settle a regulatory issue and the agency must then exercise its judgment in moving from the facts and probabilities on the record to a policy conclusion. Recognizing that policymaking in a complex society must account for uncertainty, however, does not imply that it is sufficient for an agency to merely recite the terms ‘substantial uncertainty’ as a justification for its actions.” See also *Public Citizen, Inc. v. NHTSA*, 374 F.3d 1251, 1261-62 (D.C. Cir. 2004).

²⁰ Light Vehicle AEB FRIA, Docket No. NHTSA-2023-0021-1069, at 252 (FRIA).

contribute to costs or benefits in the rule. The FRIA acknowledged that removing that assumption would reduce the magnitude of the estimated safety impacts. However, as the estimated benefits from the final rule are 17 to 21 times greater than the costs, it is unlikely that disbenefits from incremental false positives resulting in an increase in rear-end crashes would render the rule not cost-beneficial.

Despite these limitations, we nonetheless considered the problem qualitatively and addressed it to the extent possible. We emphasized that because market penetration of AEB is very high, incremental disbenefits resulting from all applicable vehicles having rule-compliant lead vehicle AEB would be insignificant.²¹ We also emphasized our belief that false positives would not occur in well-designed AEB systems, especially with the integration of supplemental technologies. These technologies can include providing sufficient redundancy or continuously receiving and updating information regarding a vehicle or pedestrian as the vehicle approaches.

Additionally, we did not simply disregard risks of false activations due to the speculative nature of the risks. We incorporated two false positive testing scenarios to establish a minimum level of system functionality in avoiding such events. We noted that, while certainly not comprehensive, we selected these scenarios because we believe they represent the most common scenarios systems will encounter and they address known engineering challenges for existing AEB systems.²²

Furthermore, we also emphasized many possible benefits from the rule that the analysis also could not quantify. These include safety benefits associated with crash scenarios and parameters outside of those reflected in agency testing, safety benefits from avoiding secondary crashes, safety benefits from preventing or mitigating crashes with other vulnerable road users or animals, and property damage and traffic congestion avoided.²³

²¹ FRIA at 252. Petitioners argue that this analysis is unconvincing because of the timeline of fleet turnover. However, the moment of 100 percent fleet adoption is not the only relevant timeline. Table 218 in the FRIA shows cumulative exposure by year. By year 6, we anticipate that 50 percent of the fleet will have rule-compliant AEB such that concerns about additional rear-ends derived from false activations will be significantly abated.

²² 89 FR 39686, at 39732; FRIA at 47.

²³ FRIA at 47.

In contrast, the petitioners simply asserted speculative disbenefits based on theoretical scenarios. The Alliance, for example, presented simulation data to support the possibility of rear-end collisions that could occur if a vehicle has a false positive with a human driver behind it, but it did not provide any evidence that the false positive events themselves would occur in greater frequency or severity under the final rule compared to no requirement or an alternative requirement.²⁴ Additionally, Volkswagen asserts that “no contact” “will undoubtedly lead to higher false positive rates” in scenarios in which a pedestrian changes their travel path following the onset of braking, and Toyota made a similar claim with regards to lead vehicle AEB.²⁵ When considering the balance of costs and benefits, petitioners seek to place greater weight on speculative and unquantifiable disbenefits without considering the added benefits which may also be obtained. These assertions are insufficient to demonstrate that the speculative disbenefits outweigh the benefits of a no contact requirement. Without sufficient information to fully quantify either, it is not unreasonable for NHTSA, in its expert judgment and in consideration of the Safety Act’s focus on safety, to select the option that maximizes possible safety benefits.

b. Defect Authority

The Alliance stated that it is insufficient for NHTSA to address false positives through the agency’s safety defect authority. The Alliance stated that false positives are an unwanted side effect, similar to an issue experienced with early higher-powered airbag technology, which NHTSA needs to address through rulemaking to amend the performance requirements rather than through recalls. The Alliance argued that after the new FMVSS, “[i]t is not sufficient, or fair,” to continue to “address ‘false positives’ through [NHTSA’s] safety defect authority.” This

²⁴ We also disagree with the petitioners’ conclusions about these hypothetical scenarios. If the driver of the following vehicle maintains the safe distance required by law, a collision with the rule-compliant subject vehicle would not occur. Additionally, as we noted in the final rule, if an AEB activation of the subject vehicle leads to a collision with the following vehicle in a true positive situation, we believe that the AEB activation effectively reduces the likelihood of multiple collisions in a single crash. The AEB system would prevent the subject vehicle from colliding with an obstacle—whether another vehicle or a pedestrian—in its path.

²⁵ Nothing in the final rule prevents systems from relaxing braking once an imminent collision is no longer present or from designing AEB systems with algorithms that suppress AEB activations in certain circumstances such as after a substantial steering input or the application of additional throttle. However, when tested according to the procedures specified in the rule, the system must operate to avoid a collision.

argument primarily stemmed from the Alliance’s claim that, due to current limitations in AEB technology, increasing the sensitivity of an AEB system to meet the performance requirements of the new FMVSS would increase the likelihood that the AEB system would also erroneously detect obstacles where none exist.

Agency Analysis

The Alliance’s arguments do not support reconsideration of the final rule for several reasons.

First, the variability of false positive scenarios lends itself to the more individualized review of real-world operation that the defects process allows. As we noted, the final rule included two false activation test scenarios, but these are not comprehensive for eliminating susceptibility to false activations.²⁶ The best forum for such an individualized review is NHTSA’s defects authority, which can accommodate investigations that consider the reasonableness of the potential safety risks in light of all of the facts and circumstances. In contrast, an FMVSS sets a static performance requirement for all systems. Therefore, the defects authority is an appropriate avenue for addressing false positive events.

Second, there is an established precedent of both NHTSA and manufacturers addressing false positive AEB events through safety recalls. In the past, vehicle manufacturers have filed recalls based on the safety risk that, for example, has been described as “[i]f the AEB system unexpectedly activates while driving, the risk of a rear-end collision from a following vehicle may increase.”²⁷ Likewise, NHTSA has undertaken multiple defect investigations of potential safety risks arising from false activations of AEB systems.²⁸ The public has similarly raised

²⁶ 89 FR 39686, at 39732.

²⁷ See, e.g., Tesla, Part 573 Safety Recall Report, No. 21V-846, Unexpected Activation of Automatic Emergency Brake, available at <https://static.nhtsa.gov/odi/rcl/2021/RCLRPT-21V846-7836.PDF>.

²⁸ See, e.g., NHTSA, Opening Resume: Engineering Analysis EA 24-002, *Inadvertent Automatic Emergency Braking*, available at <https://static.nhtsa.gov/odi/inv/2024/INOA-EA24002-11766P1.pdf>; NHTSA, Opening Resume: Preliminary Evaluation PE 24-008, *Inadvertent Automatic Emergency Braking*, available at <https://static.nhtsa.gov/odi/inv/2024/INOA-PE24008-10868.pdf>; NHTSA, Opening Resume: Preliminary Evaluation 24-013, *Inadvertent Automatic Emergency Braking*, available at <https://static.nhtsa.gov/odi/inv/2024/INOA-PE24013-12241.pdf>; NHTSA, Opening Resume: Preliminary Evaluation 23-017, *Inadvertent Automatic Emergency Braking*, available at <https://static.nhtsa.gov/odi/inv/2023/INOA-PE23017-10785.pdf>.

concerns about the safety risks associated with AEB false activations, requesting NHTSA apply its safety defect authority to the issue.²⁹ This established practice demonstrates that using the defects authority to address false positives has been effective and workable, and the Alliance does not explain why it will not continue to be under the final rule.

Third, the Alliance's petition suggests that current technical limits in AEB equipment, such as sensor range or definition, would make it unfair for NHTSA to act on safety risks that were a byproduct of manufacturer efforts to meet the performance requirements of the new FMVSS. However, in striving to protect the public, the Safety Act requires manufacturers to remedy all unreasonable safety risks in their vehicles, regardless of the reason for their origin. A manufacturer's good intention is not a defense to a recall.³⁰

Fourth, the false positive risks that petitioners raise are speculative. No petitioner or commenter has identified an aspect of the new FMVSS that will cause future defects related to false positives. At most, the Alliance has identified challenges with existing AEB technology that could lead some manufacturers to inadvertently be imprecise or overinclusive when calibrating the sensitivity of their AEB systems to meet the new FMVSS. The Alliance has not suggested that these errors in implementation would be impossible to eliminate or mitigate once they became apparent.

Finally, the Alliance's example of early, "high-powered" air bags is an inapt analogy. Early versions of air bags deployed with a fixed amount of force that posed a risk of injury to occupants. These risks were not an occasional byproduct of those air bags but were inherent to the forces generated when those air bags deployed as quickly as needed to meet the performance requirements of the original air bag FMVSS. As air bag technology improved, air bags became capable of modulating the force of their deployment to limit the injurious potential of their

²⁹ See, e.g., NHTSA, Opening Resume: DP 19-001, Defect Petition for False Automatic Emergency Braking, available at <https://static.nhtsa.gov/odi/inv/2019/INOA-DP19001-5499.PDF>. NHTSA also often receives customer complaints regarding the issue through Vehicle Owner Questionnaire submissions.

³⁰ See 49 U.S.C. 30116 *et seq.*; 49 U.S.C. 30102; *see also* 49 U.S.C. 30118 (establishing that general recall notification responsibilities apply to all defects and is not based on design intent).

inflation. When updating the FMVSS to require advanced air bags, NHTSA noted that “the fact that we are requiring manufacturers to provide improved air bags in new vehicles does not mean that earlier vehicles that do not meet the new requirements have a safety-related defect.”³¹ By contrast, an AEB false positive (such as braking in the absence of a true obstacle) is not a behavior required by the final rule. Rather, it is at most an accidental engineering failure from trying to design an AEB system with sufficient sensitivity to meet the performance standard. In fact, AEB false positives are more like the safety defects posed by air bag inflator ruptures. These occur when, in an effort to design air bag systems capable of meeting the intense inflation demands of the FMVSS, engineering failures cause ruptures which project debris. In the same way, even assuming the Alliance is correct that the performance demands of the final rule may sometimes result in faulty AEB system designs that are susceptible to false positives, those false positives are a failure in the implementation of the AEB system, not an inherent performance characteristic of the standard.

For these reasons, no reconsideration is needed on this issue.

c. Comparison to a Standard that Allows Low-Speed Contact

To address false positive risks and practicability concerns, Volkswagen and Toyota petitioned for the consideration of allowing a low-speed contact, such as up to 10 km/h (6.2 mph).³² They present two justifications. First, they make a novel assertion, not raised during the NPRM comment period, that NHTSA implicitly accepts contacts under 10 km/h because the final rule does not require AEB systems to operate at speeds 10 km/h and below. Second, Toyota claims that NHTSA’s analysis did not establish how no contact meets the need for safety in comparison to low-speed contact alternatives.³³

³¹ 65 FR 30680, 30705 (May 12, 2000). The same approach is true for FMVSS No. 127: the fact that vehicles manufactured before the new FMVSS takes affect may have AEB systems that do not meet the new standards (or perhaps do not have AEB at all) does not mean those earlier vehicles have safety-related defects simply because they do not meet the new standards.

³² Hyundai also discussed this issue in its letter.

³³ Hyundai, in its letter, argued that a 10 km/h minimum allowable collision speed would preserve the safety benefits of the rule because contacts under that speed are unlikely to result in serious injuries or fatalities. One comment discussed in the final rule stated similarly. 89 FR 39686, 39272.

Agency Analysis

Petitioners' arguments do not support reconsideration of the final rule. As an initial matter, NHTSA's analysis fully considered this issue and the relevant alternatives in the rulemaking. In the NPRM, we sought comment on alternatives to the no contact requirement, specifically regarding allowing low-speed contact in on-track testing for both PAEB and lead vehicle. We received extensive comment both in support of and against allowing contact at low speeds. In the final rule, the agency disagreed that a low-speed approach fully resolved the safety problem, emphasizing that no contact provides maximum safety benefits and aligns with the Safety Act. We reiterated that striking a person with a vehicle is unacceptable at any speed under any conditions, and the analysis in our FRIA supports that conclusion. We believe the data and analysis in the final rule and the FRIA demonstrate the safety basis upon which "no contact" was selected over low-speed alternatives. Therefore, we are not amending the final rule on these bases. However, as petitioners have presented a new framing of the argument regarding the 10 km/h (6.2 mph) activation threshold, we take this opportunity to highlight the data and analysis that supports the final rule to respond to the points raised by petitioners.

Petitioners present a false equivalency between the activation threshold and contact speeds. Activation of an AEB system while moving below 10 km/h is a different scenario from continuing to move at up to 10 km/h after an activation has already occurred. The impact speed is part of the in-operation performance of the system. That is, once an AEB system detects an imminent collision with a vehicle or pedestrian, we anticipate that the systems will remain active as long as the imminent collision risk persists. The AEB minimum activation speed, on the other hand, is selected as a design specification. Petitioners attempted to conflate these circumstances, which is unpersuasive.

Additionally, the activation threshold exists to ensure practicability, not because no safety concerns exist below that speed.³⁴ When discussing PAEB testing in the NPRM, for example, we noted that the lower bound was chosen based on a tentative conclusion, corroborated by our 2020 testing and testing on vehicles from model years 2021 and 2022, that PAEB systems may not offer consistent performance at speeds below 16 km/h (9.9 mph) and that 10 km/h (6.2 mph) is consistent with Euro NCAP's testing lower bound.

In addition to those stated in prior notices, there are several other reasons for the practicability concerns that justify a distinction between 10 km/h as an activation threshold and as a maximum contact speed in testing. First, at speeds below 10 km/h, the driver has more time to re-engage and apply the brakes to avoid the collision without AEB intervention. Second, AEB systems can have difficulty operating in very tight spaces and at low speeds such as in crowded parking garages, where manoeuvres at low speed may need to occur in crash-imminent scenarios. Third, certain vehicles to which the regulation applies may need to push objects while operating at low speeds. Finally, our testing and data collection showed both that no systems operated at speeds under 5 km/h (3.1 mph), and that some vehicles that performed well in high-speed testing did not operate under 10 km/h (6.2 mph).³⁵ These data suggest design challenges specific to low-speed operation. NHTSA considered these factors and determined that it was practicable to require only that systems operate above 10 km/h. Therefore, the activation threshold and whether to allow an impact speed have distinct considerations that justify different approaches.

Furthermore, no contact better meets the need for safety in comparison to a regulation that allows low-speed contact. The data and analysis in the FRIA show that allowing for contact, at any speed, results in less safety benefits than are achieved by the final rule. In analyzing the

³⁴ We have been consistent in our belief that collisions under 10 km/h present a safety risk. In the NPRM, we noted that “not requiring PAEB to be active below 10 km/h (6.2 mph) should not be construed to preclude making the AEB system active, if possible, at speeds below 10 km/h (6.2 mph). In fact, the agency anticipates that manufacturers will make the system available at the lowest practicable speed.” 88 FR 38632, at 38667.

³⁵ NHTSA-2023-0021-0005, Table 3.

capabilities of AEB technology, at least one vehicle tested was able to meet the no contact requirement in each scenario. Therefore, the benefits in the FRIA represent the level of safety associated with the best performer.³⁶ The injury risk curves in the FRIA represent the likelihood of injury based on impact speed. In general, the likelihood of injury, and more severe injuries or fatalities, increases with respect to contact speed. And, although there are limits to the precision of the conclusion that can be drawn due to data limitations, the injury risk curves show that allowing for contact at any speed results in less safety benefits than are achieved by the best performer. NHTSA's analysis therefore fully considered this issue.

The PAEB data clearly show that a low-speed contact alternative would achieve substantially less safety than no contact.³⁷ Even at the lowest impact speeds of 0-5 mph, there is a 75 percent chance of minor injury, 4 percent chance of a moderate severity injury, and a 1 percent chance serious injury or worse. Furthermore, at even the next impact speed group, there is a non-zero probability of a fatality.³⁸ NHTSA considered these risks in deciding that no contact in PAEB testing meets the need for safety.

By applying these percentages to the PAEB data across the injury severity categories in the estimated benefits of the final rule, we find significant benefits to a no contact standard.³⁹

³⁶ This ties the benefits calculations directly to a vehicle's observed test performance. In contrast, fully calculating the benefits of a standard that allowed contact would require adjusting the best performer away from the test data. This would involve assumptions about best performance under the rule that are not tied to observed performance and reduce the accuracy of the benefits calculations.

³⁷ Injury risk data used in this paragraph is presented in the FRIA, Table 131. The table and this data are rounded to the nearest hundredth. The true figures are as follows: at a maximum contact speed of 5 mph, approximately 0.4 percent of collisions would result in fatality, 75 percent would result in minor injury, 4 percent in moderate injury, and 0.7 percent in serious injury. These descriptions correspond to the maximum abbreviated injury scale (MAIS) categories, described on pages 238-239 of the FRIA. Minor injuries can include non-superficial injuries, including those with long term effects such as whiplash, and moderate injuries include a fractured sternum.

³⁸ Petitioners suggested allowing contact at up to 10 km/h, which would correspond to a roughly 6 mph impact speed. The data in the FRIA is organized by miles-per-hour, so for this response we discussed injuries in the impact speed range closest to but below this figure, which is 0-5 mph.

³⁹ Although this discussion is new analysis in response to the petitions for reconsideration, we note that this analysis uses only data already in the FRIA and uses no proprietary statistical methods. In the FRIA, PAEB is considered in crossing path and along path scenarios. For along path scenarios, we assume that all pedestrian impacts would be avoided under a no contact requirement, so allowing contact would distribute those incidents that would have been avoided across each injury severity category by the percentage of injuries associated with each severity at the selected contact speed. For crossing path scenarios, even under a no contact requirement there are situations in which pedestrians enter the path of the vehicle with insufficient time for detection and braking to avoid the collision. Therefore, the expected effect of allowing contact should account for a reduced number of both avoided and mitigated injuries.

Allowing contact at low speeds would lead to 2,192 additional minor injuries, 31 moderate injuries, 3 serious injuries, and 1 fatality annually. Monetized, this change results in \$179.1 million comprehensive economic benefits lost, or 4.9 percent of the PAEB benefits generated by the final rule.⁴⁰ This is a sizable impact, and one that NHTSA considers meaningful. Indeed, \$179.1 million of comprehensive economic benefits is larger than those of many entire safety rules we issue.

For lead vehicle AEB, the low-speed injury data in the FRIA has more limitations than that for PAEB. The relatively small number of severe injuries that occur in rear-end collisions at low speeds compared to those that occur in high speed collisions causes implausible analytical results that limit the precision of the conclusions that can be drawn about the exact level of safety benefit obtained at low impact speeds. Nonetheless, the available data demonstrate that benefits would be lost with a contact standard and the general magnitude of those lost benefits.

The injury data in the FRIA show that allowing contact at any speed reduces the safety benefits.⁴¹ At a relative contact speed of 10 mph (the difference between striking vehicle speed and struck vehicle speed), the probability of minor injury increases to 21.9 percent, moderate injuries to 0.9 percent, serious injuries to 0.7 percent, and even 0.1 percent chance of a fatality. In fact, even at a relative contact speed of just 1 mph (contact at 2 mph), there is a 3.5 percent chance of minor injury and a 0.4 percent chance each of moderate and serious injuries. The FRIA contains an example calculation to show how these figures are derived and factor into NHTSA's benefits analysis.⁴²

⁴⁰ Performing the same analysis as used in this paragraph on contacts up to 10 mph yields additional lost benefits of only 0.7 percent. This result suggests that most of the safety benefits lost from a low-speed contact option are lost in the contact allowance.

⁴¹ FRIA, Table 108.

⁴² FRIA at 761 (the example begins on p. 763). Note that it appears some of the values in FRIA Table 317, which summarizes input parameters, appear to be incorrect. Table 317 stated that the TTC Duration(s) were 2.01 for each FCW scenario. The correct values are as follows: Status quo (SQ) Lead Vehicle Stopped (LVS) of 2.01, SQ Lead Vehicle Moving (LVM) of 2.09, SQ Lead Vehicle Decelerating (LVD) of 2.14, Best performer (BP) LVS of 2.06, BP LVM of 2.12, and BP LVD of 2.23.

The data and analysis in the FRIA show that while low-speed collisions are less likely to result in severe or fatal injuries, reducing the number of injuries that are less severe can carry large safety benefits due to the large volume of those injuries. As the final rule states, between 2016 and 2019, there were an average of 1.75 million rear-end crashes annually (and nearly 55,000 frontal crashes with a pedestrian). Even small changes in injury risk can have sizable impacts across that volume of collisions.⁴³ Additionally, even injuries classified as less severe in the data cause serious harm, and these injuries, such as whiplash, can carry long-term effects. In the final rule, the agency concluded that although the data is limited, it plainly indicates that a no contact standard achieves greater safety benefits than a standard that allows contact.

In contrast to the data collection and analyses done by NHTSA, petitioners suggest that NHTSA should prioritize speculative disbenefits from false positives over the demonstrable safety benefits that a no contact requirement achieves. Petitioners did not provide any new information or data that was not already considered by the agency during the development of the final rule in response to public comments suggesting that a low-speed alternative would better meet the need for safety. Nor did they provide, at any stage in the rulemaking, compelling information regarding the increase in false positives that they fear or evidence that a no contact requirement will result in such an increase while allowing a 10 km/h (6.2 mph) contact speed would not. Although we recognized that there are unquantifiable aspects, NHTSA was well within its responsibilities to consider this risk but to weight more heavily the demonstrable safety benefits achievable by a no contact requirement. The Safety Act entrusts NHTSA with this responsibility and to exercise its judgment, and we did so. Therefore, no reconsideration is necessary, and we deny the request for reconsideration to allow low-speed contact.

B. Multiple Trials

⁴³ FRIA, Tables 225 and 251. Note that these crash estimates were not used to estimate benefits. The target population used to estimate benefits for lead vehicle AEB and PAEB included several filters to best reflect the real-world crashes that corresponded with the test scenarios and conditions.

The final rule requires that the test vehicle meet the performance test requirements in any test run and does not allow multiple test runs in which the vehicle is only required to meet the required performance in a percentage of the runs. Petitioners requested that the standard be amended to incorporate multiple test runs to allow a vehicle to meet the performance requirement in some but not all runs, and provided several reasons discussed below.

1. Comparison to FMVSS No. 135 and Forms of Variability

Petitioners argued that the final rule did not account for the variabilities in testing. They requested FMVSS No. 127 be amended to be similar to FMVSS No. 135, which allows for compliance to be determined based on multiple test runs. Petitioners suggested several variations, including passing 5 out of 7 runs (which is similar to NCAP), passing 3 out of 5 runs, and a requirement that if the vehicle fails the first run it must pass three subsequent runs.⁴⁴

The Alliance stated that existing braking standards, specifically FMVSS No. 135, acknowledge the inherent variability in vehicle braking systems that make it unreasonable to evaluate performance based on a single test run. The Alliance suggested that since AEB is a braking system, it has these variations, which raise practicability concerns when a test requirement does not allow for multiple test trials. These variations derive from both foundational braking mechanisms and additional variability from sensing and perception responses. Therefore, the Alliance argued that NHTSA failed to recognize that FMVSS No. 127 deviates from its established practice of permitting multiple test runs for braking standards. Moreover, it claims that NHTSA did not provide any explanation in the final rule for departing from this longstanding precedent.

Agency Analysis

NHTSA received comment on and fully considered the issue of multiple trials during the rulemaking. The arguments raised in the petitions do not justify allowing multiple test trials.

⁴⁴ The Alliance also noted that, if NHTSA provides sufficient relief regarding the no contact requirement, then this relief may not be necessary.

That multiple test runs are used in FMVSS No. 135 does not mean that multiple test runs are necessary for FMSS No. 127. There is a critical difference between FMVSS No. 135 and FMVSS No. 127 that justifies a different approach.⁴⁵ The purpose of FMVSS No. 135 is to ensure safe braking performance, and its testing is designed to test braking performance of the vehicle.⁴⁶ It uses multiple test runs to account for the variability in the ability of the human test driver to maximize the braking capabilities of the vehicle. The agency published the first NPRM for what would become FMVSS No. 135 in 1985. In that NPRM, the agency stated that “[t]he purpose of specifying multiple stops is to enable test drivers to achieve a vehicle’s best performance.”⁴⁷ That preamble further stated that it normally took test drivers three or four stops to achieve the best possible braking performance. NHTSA has also rejected incorporation of multiple test runs into the standard for the “hot stop” test because NHTSA found in its testing that the human test drivers were capable of achieving the needed performance for the test, and the test needed to occur while the brakes were at temperature.⁴⁸ Additionally, in FMVSS No. 126, an example of a standard where NHTSA found a single test run to be sufficient, the sine-with-dwell test provides for only one test run at each steering-wheel amplitude and rotation direction combination. Further, in the final rule establishing FMVSS No. 136, “Electronic stability control systems for heavy vehicles,” NHTSA stated that FMVSS No. 136 allows multiple attempts to maintain the lane for J-turn testing to ensure that the ESC system activates before the vehicle becomes unstable instead of imposing a requirement that it activate prior to instability to “account for driver variability and possible driver error in conducting the manoeuvre. Absent driver error, we do not expect any vehicle equipped with current-generation ESC systems to leave the lane during any J-turn test.”⁴⁹ These examples make clear that a

⁴⁵ Not all the tests in FMVSS No. 135 use multiple trials. Those that do include: S7.5. *Cold effectiveness*; S7.6. *High speed effectiveness*, S7.7. *Stops with Engine Off*, S7.8. *Antilock functional failure*, S7.9. *Variable brake proportioning system functional failure*, and S7.11. *Brake power unit or brake power assist unit inoperative (System depleted)*. These afford up to six test runs to achieve the required performance.

⁴⁶ 49 CFR 571.135, S2.

⁴⁷ 50 FR 19751.

⁴⁸ 60 FR 6431.

⁴⁹ 80 FR 36050.

standard that permits multiple test trials is justified where testing may be affected by variability in a human test driver's ability to apply a full brake application. It may be the case that, because it allows multiple test trials to accommodate human test drivers, FMVSS No. 135 accommodates the other forms of test variability cited by petitioners. However, this result is an ancillary effect of the standard's design, not its purpose.

In contrast to FMVSS No. 135, the test procedures in FMVSS No. 127 test the AEB system and do not use human test drivers to actuate the brakes. Even for tests that include manual brake application, the test procedure specifies use of a braking robot and the performance specifications on how the brake must be actuated for the test. No variability from human operation contributes to test outcomes in FMVSS No. 127.

Indeed, the Alliance, in attempting to argue that FMVSS No. 135 test results are not informative of AEB system performance, acknowledged this distinction is meaningful. It claimed that test conditions in FMVSS No.'s 135 and 127 "are fundamentally different such that FMVSS No. 135 results are not indicative of AEB performance" because tests conducted under FMVSS No. 135 are "conducted with a human driver putting muscular effort into the brake pedal."⁵⁰ This distinction justifies NHTSA's decision not to use multiple test runs.

a. Specific Forms of Variability Raised by Petitioners

Petitioners cited several forms of variability that they argue justify multiple test runs or render the standard impracticably stringent. The Alliance, for example, cited wear and tear of pedestrian test dummies, design of pedestrian test dummies, and headlamp aim as aspects specific to AEB system performance that can impact testing. It also emphasized track conditions that contribute to stopping distance variability, such as the age and degradation of the asphalt since it was last resurfaced, the type of aggregate used on the test track, and other variables. The

⁵⁰ In making this argument, the Alliance is suggesting that NHTSA cannot rely on FMVSS No. 135 tests to show the practicability of the no contact requirement because these tests will have superior braking performance to FMVSS No. 127 tests due to added muscular effort from the driver. This claim is discussed in the "no contact" section, above.

Alliance also noted that compliance tests are conducted at any number of test tracks throughout the United States, which the Alliance claimed further amplifies variability of the test by contributing their own unique characteristics. It also noted ambient environmental effects such as cloud cover (or intermittent cloud cover), dust, debris, pollen effects, recent rainfall, and noise factors. It also stated that the road surface friction decreases as the road surface temperature increases, and provided a figure that shows road surface friction around 0.98 at a temperature of 2 degrees C and decreasing to around 0.92 at 50 degrees C, and that these variations in ambient conditions can translate into about 8-10 feet (2.5-3m) or more variation in absolute stopping distance on a given test surface. It also raised vehicle conditions, such as tire burnish, brake burnish, brake wear and brake bleed, which amplify these environmental effects. The Alliance stated that these factors (ambient conditions, vehicle conditions, and track conditions) support the reason why FMVSS No. 135 accommodates outcome variability by using multiple trials, justify using multiple trials, or justify a change in the no contact requirement.

The Alliance stated that NHTSA's data demonstrate the challenges of avoiding contact in every test that result from their cited variability. The Alliance emphasized that no test scenario showed that all tested vehicles could meet the performance requirements for lead vehicle AEB on every test run. Starting at 64 km/h (40 mph), fewer than half of the tested vehicle met the performance requirements in all the test trials. The Alliance further stated that, while the research conducted tests only up to 72 km/h (45 mph), at which only two models avoided contact, the standard requires compliance with lead vehicle AEB test at speeds up to 100 km/h (62 mph) without demonstrating the feasibility and practicability at those higher speeds. It also referenced PAEB testing, for which at the lowest tested speed (16 km/h (9.9 mph)), vehicles failed in over 25 percent of the test runs. At speeds of 65 km/h (40.4 mph) in dark conditions, the Alliance stated that no tested vehicle could comply with the requirements 100 percent of the time. The Alliance reasoned, therefore, that NHTSA's test data indicates that most vehicles do not meet the standard's requirements, and the agency has not provided any analysis

demonstrating why these data or other information prove the practicability of avoiding contact on every test run.

Agency Analysis

NHTSA disagrees that the types of variability raised by petitioners make the rule impracticable or justify multiple test runs.

First, several of these types of variability would not be resolved if FMVSS No. 127 allowed multiple test runs. For example, test track conditions, headlamp aim, and the differences between the pedestrian test device and real pedestrians, which do contribute to variability in AEB system performance, do not contribute to variability in performance across multiple test runs in the same place with the same test devices. The test track is relatively consistent across runs. Differences in the pedestrian test device and a real pedestrian may contribute to variable performance between the real world and the test track, but it does not contribute to variability across multiple runs with the same test device. Therefore, allowing multiple runs would not resolve these concerns.

Additionally, other variabilities raised by petitioners are resolved by other aspects of the FMVSS. The test conditions, including temperature range, are generally consistent with those of existing FMVSSs, such as FMVSS No. 135, which have proven effective over time in resolving many issues raised by petitioners, such as concerns with thermal effects on the surface friction of the test track. Additionally, the test procedures state that headlamps will be aimed per manufacturers' instructions and that testing will not occur during periods of precipitation or when visibility is affected by fog, smoke, ash, or particulates, which resolves many concerns regarding AEB system performance variability.⁵¹ The Alliance's concerns about the test dummies are also unfounded. Dummy wear and tear will not contribute to test performance variability because the test procedures specify the conditions for the test devices used.

⁵¹ The Alliance also petitioned for more specificity regarding "visibility" in the test condition. We provided a thorough discussion of this requirement and the reasons for not providing additional specificity in the NPRM and final rule.

The Alliance's discussion regarding vehicle and test track variability is not persuasive because it relies on studies conducted with test vehicles not specifically designed to meet the requirements of the final rule. We anticipate the variability between vehicles designed to comply with an FMVSS will be relatively small and will depend on the compliance margins set by manufacturers according to their risk acceptance strategies.

Regarding petitioners' claims that the current state of AEB technology means that multiple test runs are necessary for the standard to be practicable, we note that in the agency's 2023 research one tested vehicle was able to avoid contact on most runs, which marked significant progress compared to the 2020 testing. This and other improvements in AEB technology over time support the conclusions made in the final rule that these requirements are practicable within the allowed lead time. Under the Safety Act, the agency is empowered to issue safety standards that require advancements in existing technology or require development of new technology.⁵² Given the developmental trajectory, the agency does not find arguments based around the performance of existing AEB systems to be a persuasive argument for multiple trials.

b. System Maturity

The Alliance stated that the final rule claimed that multiple trials are not necessary for mature systems. It argued that NHTSA incorrectly assumed that AEB technologies are mature, in part because AEB systems introduced under the 2016 voluntary commitment were not designed to meet the performance requirements of the final rule. The Alliance also referenced the FRIA—which stated that because many AEB systems do not meet the rule's requirements there will be significant benefits to the new rule-compliant AEB systems—to argue that the agency cannot consider an existing AEB system installed under the 2016 commitment to be mature while simultaneously claiming significant benefits from the new systems required by the final rule. The Alliance also stated that rule-compliant AEB systems should be considered new or in

⁵² *Chrysler*, supra footnote 9.

development. It concluded that therefore these systems are not mature and should be allowed to demonstrate compliance through multiple test trials.

Agency Analysis

NHTSA is unpersuaded by the Alliance's reframing of the issue. The fact that a current system can meet the requirements of the standard shows that the technology is mature—vehicles on the road today have the requisite technology to comply with the rule. The benefits estimates assess the improvements in outcomes generated when the entire fleet becomes compliant in comparison to the status quo baseline. As we explained in the FRIA, the status quo baseline is the average performance of the vehicles included in NHTSA's testing. Therefore, the benefits claimed are representative of mature systems being required throughout the fleet.

Therefore, no reconsideration is needed. NHTSA denies the petitions for reconsideration regarding multiple trials and will not adjust the final rule to incorporate multiple test trials.

C. Equipment Requirement

The final rule includes an equipment requirement that light vehicles have an AEB system that applies the brakes automatically at any forward speed that is greater than 10 km/h (6.2 mph) and less than 145 km/h (90.1 mph) when a collision with a lead vehicle is imminent, and at any forward speed greater than 10 km/h (6.2 mph) and less than 73 km/h (45.3 mph) when a collision with a pedestrian is imminent. It also includes a performance test requirement that, when tested according to the procedures in the rule, the subject vehicle provides a forward collision warning and subsequently applies the service brakes automatically when a collision with a lead vehicle is imminent such that the subject vehicle does not collide with the lead vehicle.

The Alliance stated that the final rule lacks objectivity because NHTSA has not established performance requirements for the equipment required by final rule. It notes that while the rule requires the lead vehicle AEB and PAEB systems to operate at speeds up to 145 km/h (90.1 mph) and 73 km/h (45.3 mph) respectively, it does not define the term "operate." Additionally, the Alliance argues, although the preamble to the final rule indicated that the

systems would apply brakes when a collision is imminent, NHTSA did not define an imminent crash. To address these concerns, the Alliance requested a supplemental notice of proposed rulemaking (SNPRM) proposing objective performance requirements, including specifying what it means to “operate” the equipment and defining when a crash is “imminent.”

Agency Analysis

NHTSA is not incorporating definitions for “operate” or “imminent” and is not incorporating a test procedure. However, NHTSA is making one clarifying edit to remove reference to “imminent” in the performance test requirement for lead vehicle AEB.

NHTSA does not believe that it is necessary to provide a definition of or test procedures for the term “operate” in the regulatory text because the final rule’s definition of AEB clarifies how an AEB system operates. FMVSS No. 127 defines “Automatic Emergency Braking” as “a system that detects an imminent collision with vehicles, objects, and road users in or near the path of a vehicle and automatically controls the vehicle's service brakes to avoid or mitigate the collision.” The definition of FCW provides similar clarity regarding FCW operation. Additionally, the requirement that these systems “operate” is explicitly tied to the test conditions in S6, Test Conditions, of FMVSS No. 127. In considering the meaning of “operate” in the context of the performance requirements applicable to AEB systems, the final rule provides sufficient clarity that manufacturers can certify with reasonable care that their systems “operate” in the circumstances required by the final rule. Therefore, no definition is needed.

Regarding the definition of “imminent” as used in the equipment requirements, no regulatory definition is needed. Certainly, not all of the terms in a regulation must be explicitly defined. Here, the term “imminent” comes from the regulatory mandate in BIL.⁵³ In BIL, Congress chose not to define the term, and we interpret this provision of BIL to use the plain

⁵³ 49 USC 30129 note.

meaning of the word “imminent.”⁵⁴ Manufacturers may refer to the plain meaning when certifying their vehicles to the equipment requirements.⁵⁵ Additionally, the term is sufficiently clear in context, and its meaning is discernable from close review of the performance requirements and test procedures in the rule, such as the set of testable ranges specified.

However, we are making a clarifying change to the performance test requirement. In its petition, the Alliance appears to conflate equipment requirements and performance requirements. The final rule and NPRM distinguished between them and explained how the equipment requirement supplements the performance requirement.⁵⁶ The equipment requirement, explicitly mandated in BIL, does not have an associated performance test and compliance with it is not evaluated based on performance testing. On the other hand, compliance with the performance requirements is evaluated through the performance testing laid out in the final rule. Critically, these tests do not evaluate the activation timing of the AEB or FCW systems (other than that FCW should not activate after AEB). Rather, the performance criterion is contact with the test device (for AEB) and whether FCW activated. We therefore left to manufacturers the discretion to determine when to apply the brakes and provide the FCW, so long as their determination is not clearly erroneous.

To resolve any confusion, we are amending the performance test requirement for lead vehicle AEB in S5.1.3 to remove the phrase “when a collision with a lead vehicle is imminent.” The purpose of this change is to clarify the distinction between the performance requirements and equipment requirements in FMVSS No. 127 and does not substantively alter the

⁵⁴ Merriam-Webster defines “imminent” as “ready to take place; happening soon.” https://www.merriam-webster.com/dictionary/imminent?utm_campaign=sd&utm_medium=serp&utm_source=jsonld (accessed on 8/28/24). For an analogous determination, see 81 FR 85478, Vehicle Defect Reporting Requirements. In this NPRM, we specified a location that is “accessible” for an information label pursuant to the section 31306 of the Moving Ahead for Progress in the 21st Century Act. We noted that while the statute did not explicitly require us or the manufacturer to determine the location, selecting a standardized location would best serve the purpose of the statute by facilitating repeated consumer access to the information. We also referenced the dictionary definition of the term “accessible.”

⁵⁵ See, e.g., *Ard v. O'Malley*, 110 F.4th 613, 617 (4th Cir. 2024).

⁵⁶ 88 FR at 36832, at 38655; see also 72 FR 17235, 17299 (Apr. 6, 2007) (discussing the understeer requirement in FMVSS No. 126). The NPRM also explained how we might approach information gathering and enforcement of this requirement. The final rule also discussed NHTSA’s authorities regarding equipment requirements in response to comment regarding activation speed. 89 FR 39686, 39712-14.

requirements as described in the preamble. In fact, because NHTSA’s testing will not evaluate AEB and FCW timing, and the test scenarios themselves create crash-imminent scenarios, this language was superfluous in the performance test requirement. This change also aligns the text of S5.1.3 with the performance test criteria for PAEB (S5.2.3), which does not contain that phrase. Although the preamble of the final rule explained this approach, the change discussed here makes it clear in the regulatory text. Finally, following the change, the term “imminent” only remains in the equipment requirement. Therefore, no performance test procedure is needed to evaluate compliance.

Therefore, we are amending FMVSS No. 127 to resolve confusion in the requirements. However, we are denying the petitions for reconsideration regarding issuing an SNPRM to establish a test procedure for equipment requirements or providing a definition for “operate” and “imminent.”

D. Unlimited Preconditioning and Test Runs

The final rule does not explicitly place a limit on the amount of pretest driving a vehicle may undergo and it does not place a maximum limit on the number of test runs a vehicle may be put through.⁵⁷

The Alliance requested reconsideration, arguing that unlimited pretest driving of a subject vehicle is inconsistent with repeatable, objective test procedures. It also argued that the agency could accrue thousands of miles on the test vehicle, degrading the tires and other wear components, before running the compliance test. Petitioners expressed concern that manufacturers would have no way to predict what the agency’s pretest driving scenarios will do to the subject vehicle, making it impossible to certify compliance. Similarly, it stated that, under the test procedures as written, a vehicle can be tested unlimited times until one failed test trial occurs, in which case the vehicle would be non-compliant.

⁵⁷ Specifically, test procedures state that prior to the test the subject vehicle is driven at any speed, in any direction, on any road surface, for any amount of time.

Agency Analysis

NHTSA is not granting reconsideration on this issue for two reasons. First, the purpose of FMVSS No. 127 testing is not to be an endurance or durability test, but a test of as-new hardware. This purpose is apparent in the structure of the rule compared with several other FMVSSs. When there are endurance and/or wear requirements in the FMVSSs, these requirements are apparent (i.e., they are titled “durability” or “endurance” tests) or are specifically written to indicate minimum required durability limits.⁵⁸ For example, FMVSS No. 106 contains a water absorption and whip resistance requirement, which identifies both the length of time the hose sample will be submerged under water, and how long the hose sample will be flexed.⁵⁹ There are numerous other examples in FMVSS No. 106 and other FMVSSs of this style of endurance testing that establishes a minimum durability performance. FMVSS No. 127 contains no such provisions. It was not written to, and is not intended to, set endurance or wear limits on the base equipment making up the AEB system. Instead, FMVSS No. 127 is intended to ensure a minimum level of performance of AEB systems. The only expected wear on the components is what is necessary for establishing a repeatable test, which is specified in the test procedures (i.e., brake burnishing). In the event that wear and tear result in an apparent non-compliance during agency testing, the agency would not consider these tests valid. The Agency has demonstrated, through decades of testing, the competency to determine if wear is the source of an apparent non-compliance, be it by conducting additional testing, disassembly and visual inspection, and other similar methods. Finally, any specific limits on preconditioning driving time or test runs would be arbitrary. Therefore, given that that FMVSS No. 127 does not establish an endurance or durability test, NHTSA determined it is not necessary to specify such limits.

⁵⁸ See, e.g., FMVSS No. 108, S14.9.3.6, Turn signal flasher durability test; FMVSS No. 111, S5.5.7, Durability and S14.3, Durability test procedures; FMVSS No. 139, S6.3 Tire Endurance; and FMVSS No. 209, S4.2(d) and S5.1(d), which establish a test for the resistance of seat belt webbing to abrasion.

⁵⁹ S5.3.7, Water absorption and whip resistance (“A hydraulic brake hose assembly, after immersion in water for 70 hours (S6.5), shall not rupture when run continuously on a flexing machine for 35 hours (S6.3).”).

Second, manufacturers misunderstand the purpose of the pretest conditioning language. The initial conditions contained in S6, S7, S8, and S9, are written to prevent designing the AEB system to sense specific pre-conditions of the test. They are not intended to enable the agency to conduct durability testing. For instance, petitioners expressed concern that the standard states that the agency will drive the vehicle in any direction for any amount of time prior to the start of the test. However, additional conditions listed in S6 state that consumable fluids (including fuel), or battery charge for electric vehicles, will be between 5 and 100 percent. Additionally, the initialization conditions state that the vehicle will be driven at a speed of 10 km/h or higher for at least one minute prior to testing and subsequently the starting system is not cycled off prior to testing. Because the starting system is cycled off during fuelling, these conditions provide a practical and realistic limit on the amount of time the agency can drive the vehicle during preconditioning prior to any single test. Therefore, petitioners' concerns regarding "unlimited pretest driving" are misplaced.

As such, reconsideration is unnecessary to resolve petitioners' concerns. Therefore, NHTSA declines to amend the final rule on this issue.

E. Malfunction Indicator Lamp

The final rule requires that vehicles must detect AEB system malfunctions and notify the driver of any malfunction that causes the AEB system not to meet the minimum proposed performance requirements.

The Alliance and Volkswagen stated that the requirement that the malfunction indicator lamp (MIL) illuminate under all malfunction conditions, including sensor degradation, and under all possible conditions of "adjustments in performance" lacks objectivity and practicability. The Alliance petitioned NHTSA to issue an SNPRM that would define each malfunction requiring MIL illumination and include an associated test procedure. It did not provide any additional data or analysis beyond what has already been considered in comments to the NPRM.

The Alliance noted that while the requirement for activating a MIL in the event of a malfunction in an AEB system is consistent with other FMVSSs, the final rule neither explicitly defines malfunction nor provides the associated test procedures. Several petitioners requested an objective definition of “malfunction.” The Alliance pointed out that FMVSS No. 135 specifies conditions for MIL activation, and FMVSS No. 138 provides malfunction conditions and test procedure for the tire pressure monitoring system. In contrast, it stated, “malfunction” in FMVSS No. 127 is not defined and could include sensor degradation, which exceeds typical MIL illumination requirements in the FMVSSs. It stated that without a clear definition, manufacturers may determine a malfunction at their discretion and adjust AEB performance to any performance level, including complete deactivation, that does not meet the requirements of the final rule. The Alliance stated that if its interpretation is correct, the standard should clearly specify the allowance to adjust AEB systems, including complete deactivation, during a defined malfunction state.

Additionally, the Alliance stated that NHTSA did not establish an objective test procedure for automatically detecting system changes that may affect AEB performance. The Alliance stated that the requirement to detect vehicle owner’s modifications that could render the AEB system non-compliant is boundless and lacks specific, objective performance criteria and test procedures, unlike other FMVSSs. For example, FMVSS No. 138 provides specific test procedures where the MIL must illuminate when an incompatible tire is installed. In contrast, the final rule does not limit or specify the types of owner modifications that may trigger MIL illumination, making it unreasonable to expect manufacturers to anticipate and develop detection strategies for every possible modification scenario. It stated that, as a result, the MIL requirement is not objective.

Toyota petitioned for reconsideration of MIL requirements and incorporated the Alliance’s petition into its own. Additionally, Toyota provided a description of its understanding of the malfunction requirements. It read the requirements to allow discretion to the manufacturer

to design a malfunction detection feature—including what elements to monitor and what is considered a malfunction. It also stated that if a malfunction is identified, the standard permits the manufacturer, at its discretion, to adjust the performance of the vehicle such that it will not meet the requirements specified in paragraphs S5.1, S5.2, or S5.3, including completely deactivating the AEB system, and illuminate the telltale. It said it understood the agency’s intent to be that manufacturers must design vehicles with a malfunction detection feature, and that the vehicle must display a telltale when a malfunction is detected and allow the vehicle to adjust the performance of the AEB system or deactivate it in response to malfunctions.

Toyota agreed with NHTSA that malfunctions should be detected based on the system design. Toyota argued that if the AEB system cannot be deactivated in cases of performance degradation, such as from sensor misalignment, it could result in false-positive activations potentially creating safety disbenefits. However, it nonetheless argued that the malfunction detection requirements are unclear and requested reconsideration. It noted that NHTSA had rejected suggested language from Bosch regarding malfunction detection on the basis that it was not workable for an FMVSS and lacked objectivity.

Agency Analysis

NHTSA will not adjust the malfunction detection requirements. NHTSA considered comments on malfunction detection in the final rule. Petitioners broadly expressed confusion about the term “malfunction” and about what conditions the indicator lamp must illuminate. However, Toyota, in its petition, correctly summarized the requirements, indicating that it understood the requirement as written. Nonetheless, we respond to certain issues raised in the petitions to clarify our intent.

Toyota is correct that, when a malfunction is detected, the system is permitted to reduce functionality and it must show the telltale. The intent behind the requirement is for systems to self-diagnose issues that cause them to perform at a level below that required by the FMVSS, adjust performance as the system determines is appropriate, and alert the operator. In contrast to

how petitioners describe the requirement, the standard does not require AEB systems to detect all possible conditions (or owner modifications) that could reduce functionality. Rather it requires the system to be able to make detections regarding malfunctions and conditions that cause performance degradations, allows the system to adjust performance if it makes such a detection, and requires the system to alert the operator if such an adjustment is made.

As is customary with NHTSA's standards, the laboratory compliance test procedures will specify how NHTSA intends to run its compliance test regarding illumination of a malfunction telltale. However, NHTSA is not specifying these in the regulation. The conditions under which the malfunction lamp are required to illuminate are sufficiently defined in the FMVSS, which is enough information for manufacturers to certify to the requirement. Although NHTSA is also not specifying in the regulatory text how an internal malfunction is generated, test procedures for MIL requirements typically involve creating an obvious failure condition, such as disconnecting the power source to the system, and determining if the MIL illuminates.

NHTSA will not specify instances of "malfunction." NHTSA received and fully considered comment on this issue. The range of possible malfunctions is sufficiently broad that such an approach would be unlikely to meet the need for safety because it would omit many possible malfunctions from the MIL requirement. As Toyota stated, what constitutes a malfunction is specific to the design of each AEB system, and manufacturers are best positioned to determine when a circumstance exists that causes performance to be impeded.

Furthermore, petitioners are incorrect when they state that the MIL requirement is not objective or practicable because the term "malfunction" is not given a regulatory definition. The MIL requirement in FMVSS No. 127 is stated in objective terms. It ties the requirement to illuminate the MIL upon performance adjustment to the performance requirements for AEB systems. These performance requirements are stated in objective terms. The MIL requirement is therefore also stated in objective terms.

Finally, the Alliance attempts to reference the MIL requirement in FMVSS No. 138 as a contrasting example of a MIL requirement that is objective. However, FMVSS No. 138, like FMVSS No. 127, does not provide an explicit definition of “malfunction,” instead applying the performance requirement “to a malfunction that affects the generation or transmission of control or response signals.”⁶⁰ The approach undertaken in FMVSS No. 127 is analogous: it specifies the AEB system performance requirements, stated in objective terms, as the relevant comparison. Therefore, no reconsideration is necessary. NHTSA is denying the petitions for reconsideration on this issue and is not changing the MIL requirements from those stated in FMVSS No. 127.

F. Deactivation

The final rule includes an explicit prohibition against manufacturers installing a control designed for the sole purpose of deactivation of the AEB system, except in certain cases relating to law enforcement. The final rule does, however, allow for controls that have the ancillary effect of deactivating the AEB system, such as during low-range four-wheel drive configurations, when the driver selects “tow mode,” or when another vehicle system is activated that will have a negative ancillary impact on AEB operation. It also allows for automatic deactivation in the malfunction circumstances described in the previous section.

1. Manual Deactivation

The Alliance and Volkswagen petitioned NHTSA to allow manual deactivation of the AEB system. Petitioners pointed out scenarios in which they state that AEB operation can be inappropriate or potentially hazardous. These include racetrack usage, off-road driving that requires manoeuvring around obstacles, off-road driving without low range or gear options, road infrastructure causing false positives, support vehicles for cycling races, and similar situations or dynamic driving events involving interactions with other vehicles. The Alliance also raised several scenarios where vehicles are used on public roads but under non-normal conditions, such as during parades, car shows, or sport events where vehicles are operated in close proximity to

⁶⁰ 49 CFR 571.138.

pedestrians and other vehicles. Petitioners stated that the automatic deactivation provision is inadequate to address these scenarios. The Alliance noted that, since AEB systems might not automatically differentiate between tracks or parking lots and public roads, they could potentially intervene during dynamic driving manoeuvres, disrupting the driver and posing a risk to nearby vehicles. Moreover, the Alliance noted concerns about the “automatic deactivation only” approach for installed equipment, using snowplows as an example, stating that the final rule does not cover all potentially unsafe scenarios. For instance, installing equipment like a roof-mounted kayak, canoe, or ski rack with parts overhanging the front windshield could cause sensors to detect shapes that might not lead to a malfunction but could inadvertently trigger AEB operation. Thus, it requested that drivers have the ability to disable AEB systems to resolve these circumstances.

The Alliance also requested expansion of the language in S5.4.3 of the final rule, which applies only to vehicles operating in a low-range four-wheel drive configuration, to include certain modern vehicle configurations, like those with all-wheel drive system without a transfer case or electrical vehicles using only electric motors or a combination of combustion-driven axles and electric motors, which may not have a low-range system but are still capable of off-road operations. Thus, the Alliance argued, NHTSA should broaden the applicability of S5.4.3 to include vehicles operating in any off-road mode or mode designated to the driver as appropriate for low-speed off-road operations.

Agency Analysis

NHTSA will not adjust the requirements regarding deactivation. NHTSA received and considered comments on automatic and manual deactivation of AEB systems. After consideration of those comments, NHTSA determined that allowing automatic deactivation pursuant to the circumstances in S5.4.2.2 would be practicable and most effectively meet the need for safety because it allows for controls that have the ancillary effect of deactivating the AEB while preventing installation of a control with the sole purpose of enabling driver

disablement of AEB systems. NHTSA believes that the current regulatory text, which allows AEB deactivation “when another vehicle system is activated that will have a negative ancillary impact on AEB operation,” is sufficiently broad to encompass the vehicle types that the Alliance raises. Furthermore, the purpose of S5.4.3 is to exempt vehicles that have four-wheel drive modes, selected by mechanical controls that cannot be automatically reset electrically, from the requirement that any AEB deactivation be reset by the ignition cycle. For other vehicles (such as those with all-wheel drive), the agency expects that AEB will reactivate when the vehicle is in a drive mode that allows for AEB activation, and when the vehicle’s ignition/power is cycled on/off.

Petitioners’ stated concerns about operation of vehicles with no manual AEB deactivation in unusual circumstances do not justify reconsideration. As we discussed in the final rule regarding front-mounted equipment, a well-designed AEB system will be able to detect and automatically deactivate to accommodate roof-mounted equipment such as kayaks or ski racks that may overhang the front windshield. We are also unpersuaded by requests that the final rule allow manual deactivation to account for various racing or track scenarios. The allowance in S5.4.2.2 provides relief for some of these vehicles. Additionally, our requirements apply to motor vehicles, which the Safety Act defines as a vehicle “manufactured primarily for use on public streets, roads, and highways.”⁶¹ Therefore, if a manufacturer chooses to produce a racing vehicle designed for use on public roads it must meet the minimum safety requirements. The fact that it may be used in a racing environment does not in and of itself justify a manual deactivation feature. Manufacturers may design racing vehicles not for use on public roads that do not meet the FMVSS.

2. UNECE Regulation No. 152

Volkswagen and the Alliance requested reconsideration of the agency’s decision to disallow a manual deactivation feature based on data submitted by Volkswagen. Petitioners

⁶¹ 49 USC 30102.

stated that data collected in Europe showed that, among a fleet of over 30,000 UNECE Regulation No. 152 compliant vehicles which collectively took more than 12 million trips, only 0.2 percent of the vehicles deactivated their AEB systems more than 10 times. According to petitioners, this data indicates that less than 0.005 percent of all trips involved AEB deactivation and that while drivers did use the manual deactivation feature, they did so very rarely. Thus, they argued that allowing the manual deactivation feature, with appropriate multi-step procedures to prevent inadvertent deactivation, would not significantly diminish the overall benefits of AEB systems.

Agency Analysis

NHTSA is unpersuaded that the data provided by Volkswagen demonstrates that NHTSA should adopt the approach taken by UNECE Regulation No. 152. Generally, the driving environment (road and lane design, etc.) and driver habits in the United States differ substantially from those in Europe, and there is also significant variation within European nations. These differences may result in differences in how drivers interact with AEB technology. The petitioners did not present evidence that data from the European market accurately represents driver behaviour in the U.S. market. In view of the safety concerns expressed in the final rule and by commenters, harmonization alone is an insufficient justification for allowing a control to deactivate the AEB system. As a result, we will not adopt the UNECE Regulation No. 152 approach.

Therefore, no reconsideration is necessary. NHTSA is denying the petitions for reconsideration regarding amending the automatic deactivation provision or the restriction on installing a manual deactivation control.

G. Obstructed Pedestrian Crossing Test Correction

The final rule contains a test scenario in which an obstructed pedestrian enters the path of the vehicle from the right.

In its petition for reconsideration, the Alliance argued this performance test requirement demonstrates that the final rule is impracticable. The Alliance asked NHTSA to reduce the maximum test speed and align the headways more closely with the results of NHTSA's testing.

The Alliance provided a case study of a narrow vehicle avoiding contact with the test mannequin using the boundary conditions specified in the rule and realistic vehicle stopping dynamics (a peak braking acceleration of 0.9 g and an initial braking rate of 3 g/s). The Alliance stated in its analysis that, when using nominal tolerances on the location of the vehicle test device relative to the subject vehicle positioning, the vehicle with a width of 1570 mm (61.8 in) had approximately 0.35 seconds to identify the crossing pedestrian and begin braking. However, in its analysis, when that same subject vehicle was at the maximum distance away from the intended travel path, and the vehicle test device was located as close to the side of the subject vehicle, only 0.15 seconds were available to react to the crossing mannequin. The Alliance stated that a response time of 0.15 seconds is beyond the capabilities of any AEB system and is not practicable.

Agency Analysis

Agency calculations confirmed the issue raised by the Alliance regarding the perception time in obstructed pedestrian testing at the maximum allowable test tolerances. However, the agency does not agree that this finding is an indication of the standard's fundamental impracticability. Therefore, NHTSA is amending the requirement to align with the intent of the scenario to ensure that the specified tolerances do not result in an unintentionally stringent test.

The final rule specified that subject vehicles would nominally be a meter away from the side of the vehicle test device when performing obstructed pedestrian testing. As the Alliance highlighted, the tolerance of the subject vehicle relative to the intended travel path (+/- 0.15 m), and the tolerance of the vehicle test device relative to the side of the subject vehicle (+/- 0.1 m) could add up such that the minimum distance could be 0.75 m instead of the intended 1 m. The reduction of the intended distance between the vehicle and the pedestrian mannequin by 25

percent has a significant impact on how much time the system has to determine whether to initiate braking. Additionally, as the Alliance highlighted, because we were primarily determining the vehicle test device location relative to the side of the subject vehicle, the narrower the vehicle, the less time that vehicle has to perceive the obstructed pedestrian and decide to begin braking. For narrower vehicles, this scenario renders the test more stringent than NHTSA intended.

To address the issue, the agency is adjusting how the tolerances are defined in S8.3.3, so that at most, the vehicle test device is not less than 1.0 m away from the 0 percent overlap point (the right side of the vehicle). For vehicles up to 2.05 m (79.5 in) wide, which is a majority of passenger cars, the left side of the vehicle test device will be no less than 2.2 m away from the intended travel path. This standard places the left side of the vehicle test device at least 1.15 m away from the right side of the subject vehicle, which accounts for the +/- 0.15 m lateral tolerance of the subject vehicle relative to the intended travel path prior to braking. To make sure testing is consistent, and to make sure that testing stringency does not increase for vehicles wider than 2.05 m (79.5 in), the left side of the vehicle test device will be no less than 1.15 m away from the subject vehicle.

Therefore, NHTSA is amending the specifications for the obstructed pedestrian crossing test.

H. FCW Auditory Signal

1. FCW Auditory Signal Requirements

The final rule requires the FCW auditory signal to have a high fundamental frequency of at least 800 Hz, a tempo in the range of 6–12 pulses per second, and a duty cycle in the range of 0.25–0.95, and a minimum intensity of 15–30 dB above the masked threshold.

The Alliance stated that the requirements related to the auditory signal lack specificity and were therefore not objective. The Alliance stated that the threshold sound level largely depends on the ambient noise at a given moment in time and conditions such as vehicle speed

and engine, tire/road, and wind noise. It concluded that for the requirement to be objective, NHTSA must clearly define several key characteristics, including the test conditions under which both the ambient noise and the masked threshold are measured as well as the methodology to measure and compute the sound level of the FCW warning and the noise separation amount (i.e., 5 dB). The Alliance also stated that there may need to be exceptions for high ambient noise conditions, such as convertibles with an open top.

Volkswagen similarly commented that additional information relating to compliance testing is needed such as details of the means and conditions for measuring the reference noise level to which the regulation will compare the FCW auditory signal and inquired whether the vehicle's windows would be open and/or HVAC system would be active during the testing. The Alliance, as part of its comments regarding the audio suppression requirement (the remainder of which are discussed in the next subsection), also requested additional conditions regarding the "masked threshold" and how it will be assessed. Volkswagen also questioned the meaning of "quietest level" in the masked threshold definition and how to measure it.

It further asked whether masked threshold would be determined based on a person with normal hearing or impaired hearing.

Agency Analysis

In response to petitions, NHTSA is incorporating additional description of the conditions in which the FCW auditory requirements must be met, detailing the location of the sound measurement device, and replacing "masked threshold" with "average noise level inside the vehicle." We are incorporating them to ensure clarity and to facilitate compliance.

We are adding several specifications to the FCW auditory requirement. First, that the auditory signal requirements must be met at the highest SV test speed (which is 100 km/h). Second, we are specifying that the audio requirements are met with all vehicle openings closed. This language is intended to clarify for certifying entities that during the test, openings such as the windows, doors, hood, rear hatch, and trunk will be closed, as will convertible tops. Third,

the provision now states that all subject vehicle sound-producing systems or functions are set to off, other than those necessary for performing testing under the rule. This language is intended to describe systems such as the HVAC, windshield wipers, and turn signals, which produce noise that may impact measurement of sound inside the vehicle, but which are not necessary for testing. These additions provide significant clarity regarding the conditions under which the signal will be measured. The FMVSS already states that FCW must operate under the conditions in S6, which includes items that may impact the in-vehicle sound environment, such as the environmental conditions, road conditions, subject vehicle conditions, and equipment. Therefore, those conditions will not be further specified.

NHTSA is also incorporating the intended sound measurement location, adjacent to a 50th percentile male driver's right ear tragon point. This point is identified in the anthropometric data from a NHTSA-sponsored study of the dimensions of 50th percentile male drivers seated with a 25-degree seatback angle ("Anthropometry of Motor Vehicle Occupants").⁶² The tragon is an anthropometric point situated in the notch just above the tragus of the ear and is located 614 mm vertically above the H point (hip location of a driver in the driver seating position), 185 mm aft of the H point, and 83 mm to the right of the H point.

We are also simplifying the baseline sound level against which the FCW auditory signal intensity is compared by replacing the term "masked threshold" with "average noise level inside the vehicle." We are also incorporating a description of how that level will be determined: by measuring the noise level inside the vehicle over a 5-second period under the conditions described above. This change resolves items raised by petitioners regarding defining additional aspects of the "masked threshold" as well as Volkswagen's petition regarding the hearing ability of the reference driver by simplifying the measurement to focus solely on the noise level inside the vehicle.

⁶² This report is the same as the one used as a basis for eye midpoint location set in FMVSS No. 111.

Therefore, NHTSA is incorporating these three changes to clarify the requirements applicable to the FCW auditory warning.

2. In-Vehicle Audio Suppression Requirement

The final rule required that in-vehicle audio that is not related to a safety purpose or safety system (i.e., entertainment and other audio content not related to or essential for safe performance of the driving task) must be muted, or reduced in volume to within 5 dB of the masked threshold during presentation of the FCW auditory signal.

The Alliance requested reconsideration of the requirement. The Alliance and Volkswagen stated that the requirement lacked objectivity and a corresponding test procedure. The Alliance requested that NHTSA eliminate the requirement or issue an SNPRM proposing to define the audio sources that must be suppressed and “safety purpose or safety system” sounds that are not required to be suppressed. It also asked NHTSA to propose performance requirements defining the threshold for when the audio suppression must begin, with an associated test procedure. Finally, the Alliance argued that NHTSA did not adequately consider consumer satisfaction concerns with the suppression requirement and that consumers may be unaccustomed to it, believing their audio is not working or seeking to disable the audio suppression feature.

a. Types of Sounds that Must be Suppressed

The Alliance stated that the phrase “not related to a safety purpose or a safety system” contains undefined terms that are not explained except with a parenthetical reference to entertainment. The Alliance, in its petition, noted that audio suppression systems cannot distinguish between certain content that may or may not have a safety purpose: for example, a radio broadcast of a talk show host versus a radio broadcast of an emergency weather alert. It noted that the language may result in suppression of broadcasts of FEMA’s Integrated Public Alert and Warning System, which the Alliance noted was established by Executive Order 13407 to ensure that the public has access to critical alerts about weather and other emergencies.

Petitioners also requested that NHTSA provide definitions indicating which audio sources must be suppressed and which do not. The Alliance mentioned examples for which it was not sure whether the suppression requirement would apply, such as the HVAC, defroster, seat belt reminder alarms, intelligent speeding assist indicators, and road departure alerts.

Agency Analysis

In response to this petition, NHTSA is amending the language to clarify that the requirement is to suppress audio not related to a crash avoidance warning. The intent of the requirement was to ensure that auditory signals unrelated to the vehicle's crash avoidance response in an imminent crash avoidance scenario would not interfere with the driver's perception of the FCW and thereby hinder their opportunity to intervene and avoid a crash. Given that petitioners' concerns appear to be regarding vagueness, NHTSA is clarifying the requirement to reference a more specific set of audio signals that should not be suppressed: in-vehicle audio that is "not related to a crash avoidance system warning."⁶³ NHTSA is also removing the explanatory parenthetical associated with "safety purpose or safety system," as it is no longer applicable. This change also resolves concerns with systems being able to distinguish between regular and emergency broadcasts, because emergency broadcasts are not related to a crash avoidance system warning and would therefore need to be suppressed.

Regarding the Alliance's question whether a vehicle's HVAC system and window defrosting system should be considered in-vehicle audio, they should not. In-vehicle audio is to be understood to refer to auditory signals and content produced or transmitted by the vehicle for the purpose of communicating information, entertainment, or other purpose not related to or essential for safe performance of the driving task. Although the regulation does not define "audio," NHTSA's understanding of the term is consistent with its plain meaning. For example,

⁶³ The examples used by the petitioners, including "seat belt reminder alarms," "intelligent speeding assist indicators," and "road departure alerts," should be evaluated by the manufacturer based on their propensity to assist a driver in avoiding a crash. While NHTSA could have chosen to state that, for example, audio from systems other than "Advanced Driving Assistance Systems (ADAS)" should be muted, the term "ADAS" has only been in use for approximately a decade and may describe a broader array of alerts than is appropriate.

Webster’s dictionary defines the noun, “audio,” to refer to “an audio signal.”⁶⁴ Cambridge Dictionary defines the noun “audio” to mean “a sound recording, or recorded sound.”⁶⁵ These definitions suggest “audio” to refer to purposeful sounds emitted to communicate or provide some form of information (including entertainment). Noise stemming from the operation of HVAC systems or windshield defrosters would not be considered “in-vehicle audio.” On the other hand, auditory navigation instructions are considered audio and are subject to the suppression provision. Therefore, the regulation is clear as written.

The arguments regarding consumer acceptance are not persuasive. An FCW alert is only required in a crash-imminent scenario, and the muting of in-vehicle audio would be accompanied by the FCW audio signal. In such a crash-imminent scenario, it is not evident that the muting of in-vehicle audio would be of any concern to a driver.

Additionally, in responding to this petition, NHTSA examined 15 model year 2016 – 2024 light vehicle models from 12 manufacturers to determine whether in-vehicle audio muting during FCW presentation was employed. Of 15 models examined, 11 models from 10 manufacturers were found to mute in-vehicle audio during FCW presentation. A twelfth vehicle (2022 Hyundai Tucson) reduced the volume of in-vehicle audio during FCW presentation. Three models did not appear to mute or reduce the volume of in-vehicle audio during FCW presentation (2022 Honda Odyssey, 2023 Nissan Pathfinder, and 2022 Subaru Outback). Aside from in-vehicle audio suppression during FCW, in-vehicle audio suppression under other circumstances is already present vehicles today as well. For example, some current vehicles mute in-vehicle audio while the vehicle’s transmission is in reverse gear. Audio sources in the vehicle can also be muted by apps on a phone connected to the vehicle, such as the Ring app (camera motion notifications will mute vehicle audio sources) and the Waze navigation app, which mutes vehicle audio sources while audio route instructions and other app-based verbal information is

⁶⁴ <https://www.merriam-webster.com/dictionary/audio> (accessed 7/29/2024).

⁶⁵ <https://dictionary.cambridge.org/dictionary/english/audio> (accessed 7/29/2024).

provided. Given the ubiquity of suppression of in-vehicle audio during FCW presentation, as well as other vehicle features and phone apps that suppress the vehicle's entertainment system and other in-vehicle audio, the petitioner's contention that customers will find the required audio suppression during FCW presentation to be unfamiliar and cause dissatisfaction is not compelling.

b. FCW Presentation and Suppression Timing

The Alliance stated that the suppression requirement is not objective because it lacks a definition of "presentation," and information regarding when the FCW must present or when suppression of in-vehicle audio must occur (such as whether it must occur immediately upon FCW presentation or within a specified period of time). It noted that NCAP, IIHS, and European procedures all contain a TTC value for when the FCW must present. Volkswagen and the Alliance also petitioned regarding the lack of an objective test methodology for the suppression requirement.

Agency analysis

Petitioners' arguments do not justify reconsideration on this issue. NHTSA is not incorporating a specified timing at which the FCW signal's onset must occur, a definition of "presentation," or a regulatory test procedure for evaluating the suppression requirement. FCW is required without an associated timing requirement because there is no regulatory safety need to require FCW at for any particular amount of time prior to automatic braking. Therefore, the FMVSS gives manufacturers flexibility in determining the timing of the FCW presentation for their vehicles.

NHTSA will also not provide a definition of "presentation" because the plain meaning of the term and its use in context is not vague or unclear.⁶⁶ The term is used only once in the regulatory text to describe the suppression requirement. Additionally, "FCW onset" is defined as

⁶⁶ For example, Cambridge Dictionary defines "presentation" as a noun meaning "the act of giving or showing something, or the way in which something is given or shown." <https://dictionary.cambridge.org/us/dictionary/english/presentation> (accessed 7/31/2024).

the first moment in time when a forward collision warning is provided. In understanding the meaning of “presentation,” manufacturers may consider viewing “FCW onset” as the moment at which “presentation” begins, and that “presentation” encompasses the entire time that the audible signal is active. Additionally, given the short, approximately 1-2 second duration of most FCW auditory signals, any delay in suppressing other audio content could hinder the driver’s ability to perceive the warning. As such, onset of the muting of in-vehicle audio should be simultaneous with the onset of the FCW auditory signal. There is no reason to believe, and petitioners did not suggest, that AEB systems are incapable of sending concurrent commands to initiate both FCW presentation and muting of in-vehicle audio or that response times for sending commands to initiate the FCW and the suppression would be different. Therefore, NHTSA does not expect substantial delay in suppression.

Regarding a test procedure, the changes in this rule resolve many of the questions petitioners had regarding vehicle state and sound measurement such that manufacturers have clear guidance on the suppression requirement. Therefore, no additional test procedure will be added. However, for clarity below we describe straightforward and readily apparent steps we expect to take in evaluating the requirement.

NHTSA anticipates recording and evaluating audio data during the performance of the test scenario including the activation of FCW, and manufacturers may reasonably certify to the suppression requirement by using any of the required test scenarios while audio content subject to the muting requirement is playing (e.g., music). The first opportunity to measure the muted or reduced audio level would be during the period after the first FCW auditory signal pulse and before the start of the second pulse. Sound level would be recorded beginning some time before the onset of FCW and through the end of FCW presentation. Recorded audio data would be analyzed to extract sound level (in dB) values during the FCW pulse and the period between the first and second FCW auditory signal pulse. The sound level between pulses would be analyzed

to demonstrate that the sound level had been reduced to the required level of within 5 dB of the average noise level inside the vehicle.

For these reasons, no reconsideration is needed on this issue.

I. FCW Visual Signal

The final rule states that the FCW visual signal must be located within an ellipse that extends 18 degrees vertically and 10 degrees horizontally of the driver forward line of sight based on the forward-looking eye midpoint (Mf) as described in S14.1.5. of FMVSS No. 111. It also requires that the signal include the crash pictorial symbol in SAE J2400 and that the visual signal be red and steady burning.

Both the Alliance and Volkswagen stated that the requirements are insufficient to be objective or for evaluating compliance and requested several revisions to the rule. The Alliance requested that NHTSA issue an SNPRM to propose performance requirements and test procedures.

In response to the petitions, NHTSA has determined that reconsideration is warranted on some of the items and is making changes to the regulatory text to ensure clarity in the requirements. However, comment was sought on these issues in the NPRM, and NHTSA has determined that no additional opportunity for comment is necessary, as explained in section IV. Rulemaking Analyses and Notices.⁶⁷ Therefore, NHTSA will not issue an SNPRM, and is finalizing the changes herein.

1. FCW Visual Signal Size

In its petition, the Alliance stated that the FCW visual signal requirements do not define the size of the FCW symbol.

⁶⁷ Pursuant to 49 CFR 553.37, and in accordance with 5 U.S.C. 553, the Administrator has the discretion to make a final decision or seek further comment when reconsidering a rule.

NHTSA is not incorporating a size requirement for the FCW visual signal because there is no need for such a requirement. Not specifying a minimum or maximum FCW visual signal size provides manufacturers some flexibility in how the symbol is implemented for their system.

2. Dimensions of the FCW Visual Signal Location Elliptical Area

Volkswagen requested clarification of the regulatory language regarding the required location of the FCW visual signal. Volkswagen noted that S5.1.1(b)(1) of the regulation states that “[t]he visual signal must be located within an ellipse that extends 18 degrees vertically... of the driver forward line of sight,” but that it is not clear whether this language means ± 18 degrees or ± 9 degrees from the driver’s line of sight.

NHTSA grants reconsideration on this issue and is amending the regulation to provide clarity. The regulatory language was intended to specify an elliptical cone extending ± 18 degrees vertically and ± 10 degrees horizontally from the driver’s line of sight. Therefore, a plus-minus sign will be added.

3. Clarify Whether the FCW Visual Signal Needs to be Fully Within the Ellipse

Volkswagen stated that the requirements were unclear as to whether the entire FCW visual icon or only a portion of it must be located within the bounds of the elliptical cone. Reconsideration is justified on this issue. NHTSA intended the regulation to require that the required FCW symbol must be presented fully within the defined elliptical area and is updating the regulatory text to reflect this intent. NHTSA is incorporating the word “symbol” after “visual signal” in the S5.1.1(b)(1) to clarify that the symbol is what must be located within the specified area. If a manufacturer chooses to provide any additional visual warning components (e.g., illuminating the perimeter of the instrument panel, or surrounding the symbol with an illuminated, color-shaded shape), the additional components are not required to be located within the specified elliptical area.

4. Reference to FMVSS No. 111

The Alliance and Volkswagen stated that S5.1.1(b) of the final rule requires the visual signal to be located in an ellipse formed around the forward-looking eye midpoint of the driver “as described in S14.1.5 of FMVSS No. 111” but does not specify the driver seat position and seat back angle or the steering wheel adjustment like FMVSS No. 111 does.

Reconsideration is justified on this issue. Although explicitly stating these details is not essential because to accurately locate the driver eye midpoint “test reference point” as defined in FMVSS No. 111 S14.1.5 it is necessary to follow the “Driver Seat Positioning” specifications in S14.1.2.5, NHTSA is changing the regulatory text for clarity to refer to S14 of FMVSS No. 111 instead of only S14.1.5. This change incorporates the relevant information from FMVSS No. 111.

J. Cost Estimates

The Alliance argued that the agency did not adequately consider the costs of the requirements, including consideration of the disbenefits that might be induced by the new standard. It requested that NHTSA revise its cost assessment to consider more realistic assessments of the hardware additions and other changes that will be required by the final rule, as well as identify and quantify the disbenefits in terms of increased rear-end collisions and other crashes that will be induced by the final rule, at least for several more years. In its petition, the Alliance argued that the conclusions in the FRIA are not based on the rulemaking record or on the facts in the market and led NHTSA to substantially underestimate the costs of compliance with the new standard. Based on a survey of its members, the Alliance stated that the additional costs to make current systems compliant range from \$200 per vehicle on the low end to \$4,200 per vehicle on the high end. The Alliance also claimed that NHTSA mischaracterized a meeting NHTSA had with Robert Bosch LLC (Bosch) regarding the percentage of vehicles in the fleet that may need hardware improvements.

Volkswagen stated the cost analysis as reported in the FRIA does not represent the true cost of the final rule. For example, Volkswagen argued, the requirements of the final rule cannot

be reasonably met with existing vacuum brake systems, and the PAEB requirements under conditions of darkness may necessitate infrared cameras. It stated that NHTSA did not account for the costs for additional hardware in its analysis.

Agency Analysis

The Alliance and Volkswagen's claims that the final rule did not adequately consider costs in improvements in AEB technology are mistaken. The Alliance's cost estimates are not correct estimates of the cost of compliance with the final rule because they include the cost of including head-up display (HUD) and lidar, neither of which are required to meet the requirements and account for a large portion of that higher estimate.

Additionally, the final rule fully considered the cost concerns raised by petitioners. NHTSA sought and received comment regarding hardware costs. Comments did not indicate the incremental cost associated with additional hardware commenters believed was necessary to achieve the requirements or the percentage of new light vehicles that they believe would require additional hardware. Nevertheless, the cost analysis in the FRIA accounted for a small number of new light vehicles that may need additional hardware for their existing AEB systems, such as an additional camera or radar, by including the incremental cost of adding radar to five percent of new light vehicles.⁶⁸ The Alliance disputed the 5 percent figure, noting that the information NHTSA received from Bosch suggests larger improvements are needed, and NHTSA received a letter from Bosch clarifying the figure.⁶⁹ NHTSA appreciates Bosch's clarification. However, even if NHTSA accepts for the sake of argument that the incremental cost estimate undercounts that percentage of new light vehicles that need additional improvements in computing power or sensing technologies, NHTSA's analysis fully considered these costs because the FRIA also

⁶⁸ One possible result of this assumption is that the cost analysis may in fact overestimate those incremental hardware costs because some vehicle manufacturers may add an additional camera at a lower cost than radar.

⁶⁹ Docket No. NHTSA-2023-0021-1077. The letter states that the 5 percent figure "is a significant misunderstanding and/or mischaracterization of the information provided by Bosch" and that Bosch was describing only a rough estimate of the share of Bosch-supplied AEB systems in the U.S. market that are mono-camera. Bosch also emphasized, both in the presentation given to NHTSA and in its comments on the NPRM, that certain models may require significant hardware updates such as improved sensors as well as computing power and/or improved brake systems.

included a sensitivity analysis.⁷⁰ The sensitivity analysis found that even in the case that 50 percent of new light vehicles would need to add radar to their current hardware and all new light vehicles needed a software upgrade, the final rule would remain highly net beneficial. The FRIA also includes a breakeven analysis that estimates the per-vehicle cost at which net benefits would be zero. Therefore, NHTSA's cost and benefits estimates for AEB system hardware and software were sufficient to support the final rule.

NHTSA's analysis also considered comments and the available data regarding whether the final rule would necessitate improvements in vehicles' foundational braking system and found that it would not. The agency found that vehicles subject to the final rule would already be equipped with brakes that give them the braking capabilities to meet the performance requirements specified in the final rule.⁷¹ The FRIA discussed a summary of the braking test results from FMVSS No. 135 testing.⁷² In all cases, vehicles covered by the final rule exceed the minimum requirements of the braking standards. The results further indicate that baseline vehicles already have the braking capabilities necessary to meet the minimum requirements for AEB. Additionally, NHTSA believes that the most cost-effective way (lowest cost option) for manufacturers to meet the requirements of FMVSS No. 127 is through tuning and calibration of the AEB systems rather than through increased braking capacity or additional brake hardware such as electro-hydraulic brake actuators. As NHTSA's analysis focuses on the lowest cost option that is estimated to be capable of meeting the final rule and the lowest cost option does not necessitate increased braking capacity, the costs incurred by increasing the foundational braking system were not considered. That being said, the agency provides flexibility in how manufacturers construct their AEB systems to meet the requirements and they may well choose to include brakes with increased capabilities. At any rate, the breakeven and sensitivity analyses

⁷⁰ The sensitivity analysis in the FRIA for hardware considered the case in which 10, 20, or 50 percent of new light vehicles would need either an additional camera or radar to meet the requirements.

⁷¹ FRIA at 40.

⁷² FRIA, Table 267. The Alliance's stated concerns with the relevance of this test data are discussed in Section II.A.1.b "FMVSS No. 135 Test Data" of this notice.

demonstrate that even with significant per-vehicle hardware costs beyond those estimated in the FRIA, the final rule would remain cost-beneficial.

Lastly, petitioners simultaneously claim that the final rule is impracticable but also that the requirements can only be met if certain hardware improvements are made. Given that the final rule would be economically practicable even with sizable increases in compliance costs, these statements are contradictory. Indeed, petitioners' claims regarding cost support the notion that the final rule is practicable by acknowledging the availability of technologies that can enable vehicles to meet the requirements.

Therefore, no reconsideration is necessary. NHTSA is denying the petitions for reconsideration regarding NHTSA's cost estimates.

K. Brake Pedal Robot

The final rule specified how the brake pedal force is applied during testing conducted with manual brake application. It left to the manufacturer the discretion to select the braking method that NHTSA will use when NHTSA tests the manufacturer's vehicles.

Volkswagen requested reconsideration of the decision not to provide specifications for the brake pedal robot used in the manual braking tests. It stated that differences in test equipment between the agency's test contractors and the vehicle manufacturer could lead to inconsistencies in performance.

NHTSA received comments on this issue (including from Volkswagen) and responded to them in the final rule. NHTSA clarified that the rule does not require use of a specified braking robot. The final rule specifies the brake pedal force application during testing, leaving it to the manufacturer's discretion to select the braking method for NHTSA's testing of its vehicles. The specification is sufficient to ensure test repeatability, especially given manufacturers' lengthy experience with braking robots in AEB testing. Since the petitioner did not present any new information that would warrant reconsidering the agency's prior conclusion, no reconsideration

is necessary, and we are denying the petition for reconsideration regarding the brake pedal robot specifications.

L. Manual Transmission

Glickenhaus petitioned NHTSA to reconsider and amend the standard to only require FCW (i.e., not AEB) for vehicles with manual transmission. Glickenhaus stated that substantial slowing or stopping from highway speeds in a vehicle with a manual transmission will stall the vehicle without manually shifting or engaging the clutch. It stated that sudden unnecessary braking caused by the final rule will cause a vehicle with a manual transmission to stall, thereby reducing the functionality of the brakes. A stalled vehicle, Glickenhaus stated, can create an unreasonable risk if the vehicle is on the highway and cannot move out of the way. Further, Glickenhaus stated that NHTSA's existing standards have a precedent of differentiating requirements and testing procedures for manual transmissions from those for automatic transmissions where the technology requires. Glickenhaus provided examples of those standards and what it stated are the relevant sections. Additionally, Glickenhaus stated that one FMVSS testing facility it works with confirmed that whenever it runs AEB tests on any vehicle with an automatic transmission,⁷³ the vehicle always stalls. Glickenhaus also stated that its manual gearbox supplier confirmed that will always be the case, and that this stalling could damage the drivetrain. Glickenhaus further stated that NHTSA recognizes that vehicle stalling, especially when unexpected at highway speeds, is a "substantial" hazard. Glickenhaus also stated that drivers using manual transmissions are more likely to be paying closer attention to the road than drivers of vehicles with cruise control, or any level of "self driving" vehicle functionality. Glickenhaus's petition stated that requiring only FCW for manual transmissions could increase safety by warning drivers while allowing them to place the vehicle into neutral or press the clutch to avoid stalling while braking.

⁷³ In its petition, Petitioner may have intended to state "manual" instead of "automatic" here. Regardless, our response to the petitioned-for request is the same.

Agency Analysis

NHTSA is unpersuaded that the technical limitations of AEB with manual transmission vehicles justifies excluding them from the AEB requirement. Our review of the fleet shows that AEB technology already exists for manual transmissions. Therefore, no reconsideration is needed.

There are many light vehicles sold in the US which still offer manual transmission as an option or standard.⁷⁴ Several vehicles equipped with manual transmissions, such as the 2024 Honda Civic Type R,⁷⁵ 2024 Ford Bronco⁷⁶ and 2024 Nissan Z,⁷⁷ also come with AEB and PAEB as a standard feature. Due to the wide availability of technology from various suppliers with AEB and manual transmissions, NHTSA is not persuaded that only manual application of the clutch can prevent a stall.

NHTSA is also unpersuaded that drivers of manual transmission vehicles are more engaged such that excluding them from the AEB requirement would be justified. As noted in the final rule, the timing of AEB and PAEB events do not always allow sufficient time for the driver to react and apply the brakes when a FCW is presented, regardless of the level of driver engagement.

Therefore, no reconsideration is necessary. NHTSA is denying the petition for reconsideration regarding requiring only FCW for vehicles with a manual transmission.

M. Small-Volume Manufacturers

The final rule did not alter requirements for small-volume manufacturers but allowed an additional year for compliance for small-volume manufacturers.

Glickenhause, which produces around 30 vehicles annually subject to the final rule, petitioned for reconsideration of the requirements for small-volume manufacturers, stating that

⁷⁴ <https://www.caranddriver.com/features/g20734564/manual-transmission-cars/> (accessed August 26, 2024); <https://www.caranddriver.com/features/g15379070/manual-transmission-suv/> (accessed August 26, 2024).

⁷⁵ <https://automobiles.honda.com/civic-type-r#> (accessed August 26, 2024).

⁷⁶ <https://www.ford.com/suvs/bronco/compare-models/?gnav=footer-shop> (accessed August 26, 2024).

⁷⁷ <https://www.nissanusa.com/vehicles/sports-cars/nissan-z/specs-trims.html>, accessed August 26, 2024.

the standard would cause substantial financial hardship. Glickenhause stated it had contacted Tier 1 suppliers about AEB systems and was informed that the hardware for these systems is typically developed by larger manufacturers, and there is not a baseline set of hardware and software available for Glickenhause to develop an AEB system for its very low volume vehicles. It noted that developing AEB hardware takes years, and the software calibration requires millions of miles of driving. Glickenhause claims it cannot produce enough cars and drive them long enough to gather the necessary data to create compliant hardware and software for its very low volume vehicles. Therefore, according to Glickenhause, unless Tier 1 suppliers develop starting packages for small-volume manufacturers, it would be impossible to develop a rule compliant AEB system within the lead time provided.

Glickenhause further emphasized the challenges of software development, vehicle testing, and calibration miles, which it considers nearly impossible to achieve within the given timeframe, even with an additional year. It argued out that some manufacturers have spent over 20 years developing and testing AEB systems, and that the costs of developing software and hardware for a driving automation system, including AEB functions, can exceed \$ 10 billion annually – figures that the petitioner cannot manage.

Agency Analysis

The agency initially proposed that the requirements would not apply to small-volume manufacturers until one year after the compliance date set for other manufacturers. NHTSA received more than 1,000 comments on the NPRM, including input from sensor developers that indicated that the technologies required to meet the standard are already available.⁷⁸ In the final rule, the agency provided additional lead time for all manufacturers and continued to provide small-volume manufacturers an additional year beyond other manufacturers. Given the comments we received and the availability of these systems, we expect that small-volume

⁷⁸ 89 FR 39686, 39727.

manufacturers will be able to source rule-compliant AEB systems for their vehicles from existing technologies without incurring undue expenses in research and development.⁷⁹

However, we acknowledge that there could be specific situations in which it may be particularly challenging for small-volume manufacturers to source systems. Without additional technical information regarding why Tier 1 suppliers could not provide AEB systems to the petitioner, we cannot provide further analysis regarding their circumstances. However, if the petitioner believes that the standard will cause substantial financial hardship and it has attempted to comply with the standard in good faith, it may be able to seek a temporary exemption pursuant to 49 U.S.C. 30113 and 49 CFR Part 555, subject to a determination that an exemption is consistent with the public interest.

Therefore, no reconsideration is necessary. NHTSA is denying Glickenhau's petition for reconsideration of the requirements for small-volume manufacturers.

III. Petition for Rulemaking Received by NHTSA and Analysis

A. Include V2X

In addition to the petitions for reconsideration discussed above, NHTSA also received a petition from Autotalks on June 26, 2024. Pursuant to 49 CFR 553.35, petitions for reconsideration must be received "not later than 45 days after publication of the rule in the Federal Register." Additionally, the regulation states that "[p]etitions filed after that time will be considered as petitions filed under Part 552 of this chapter."⁸⁰ Part 552 governs petitions for rulemaking. Although Autotalks's petition requested revision of the final rule, given that Autotalks's petition was received by NHTSA more than 45 days after publication of the final rule, NHTSA will treat that petition as a petition for rulemaking.

Pursuant to Part 552, when deciding on a petition for rulemaking the agency conducts a technical review of the petition, which may consist of an analysis of the material submitted,

⁷⁹ *Id.* at 39726-27, 39729, 39737.

⁸⁰ 49 CFR 553.35(a).

together with information already in possession of the agency. In deciding whether to grant or deny a petition, the agency considers this technical review as well as appropriate factors, which include, among others, allocation of agency resources and agency priorities.

In its petition, Autotalks requests incorporating a V2X transmitter to the lead vehicle and activating it during the lead deceleration test with a 12-meter gap (Table 1 to S7.1). Autotalks argues that this requirement will allow the tested vehicle to use V2X to complement its sensors. Autotalks provides technical information regarding the capabilities and availability of V2X technology.

1. NHTSA's Consideration of the Petition and Decision

NHTSA has conducted an analysis of Autotalks's petition and, after careful consideration, has decided to deny the petition and will not initiate rulemaking proposing to require the installation and use of a V2X transmitter in lead vehicle deceleration AEB testing with 12-meter headway, for the reason stated below.

In November 2023, NHTSA withdrew a proposed rule which had proposed to establish a new FMVSS mandating V2V (vehicle-to-vehicle) communication technology in all new light vehicles.⁸¹ After reviewing comments on the NPRM, NHTSA determined that, although V2V and V2X technologies may improve safety and offer innovative services to consumers, significant analysis would be needed before determining whether a new V2V standard is appropriate, and, if so, what that standard would encompass. NHTSA's position has not changed since then and Autotalks has not provided information to change that position. Therefore, NHTSA will not initiate a rulemaking to require V2X technologies in AEB systems as a result of this petition. As we stated in the November 2023 withdrawal notice, NHTSA will continue to monitor the development of this technology for possible future vehicle safety applications.

2. Conclusion

⁸¹ 88 FR 80685.

In accordance with 49 U.S.C. 30162 and 49 CFR part 552, the petition for rulemaking from Autotalks is denied.

IV. Rulemaking Analyses and Notices

This rule is a non-significant rule for purposes of Executive Order (E.O.) 12886, as supplemented by E.O. 13563 and amended by E.O. 14094, and will not impose any significant costs or have impacts beyond those analyzed in the final rule published on May 9, 2024.⁸² DOT has determined that the regulatory analyses conducted for the May 9, 2024 final rule remain applicable to this action. DOT makes these statements on the basis that this final rule makes technical or clarifying changes to FMVSS No. 127 as established in the May 9, 2024 final rule. In addition, this final rule is not expected to impact the estimated costs and benefits detailed in the final regulatory impact analysis included in the docket listed in beginning of the final rule published on May 9, 2024.

NHTSA finds it has good cause to make these changes without notice and comment pursuant to the Administrative Procedure Act (APA, 5 U.S.C. 551, et seq.). Section 553(b)(B) of the APA provides that, when an agency for good cause finds that notice and public procedure are impracticable, unnecessary, or contrary to the public interest, the agency may issue a rule without providing notice and an opportunity for public comment. The May 2024 final rule is the product of an extensive administrative record with opportunity for public comment on the issues discussed in this final rule. The changes in this final rule are made in response to petitions for reconsideration submitted to NHTSA in response to and docketed in the record of the May 2024 final rule in accordance with 49 CFR 553.35 and 49 CFR 553.37.⁸³ In response to those petitions, NHTSA makes only clarifying changes to the May 2024 final rule to align the regulatory text with the explanatory material in the preamble of that final rule.

⁸² 89 FR 39686.

⁸³ These regulations grant to the Administrator the authority, consistent with 5 U.S.C. 553b(B), to issue a final decision in response to petitions for reconsideration without further proceedings or with opportunity for further comment as the Administrator deems appropriate.

Specifically, NHTSA removes the term “imminent” from the performance test requirement. This change resolves a point of confusion expressed by petitioners and aligns the regulatory text with the intent of the May 2024 rule as expressed in the preamble by clarifying that the performance test does not evaluate AEB activation timing. NHTSA also amends a test scenario in FMVSS No. 127 highlighted by petitioners that, when tested with very narrow vehicles at the extreme of the tolerances allowed by the test condition, resulted in a stringency beyond that intended by NHTSA. NHTSA makes that amendment to ensure the correct level of stringency. Petitioners also requested clarification of the specifications in FMVSS No. 127 for the FCW visual signal location. NHTSA amends the regulatory text to clarify these specifications. Petitioners also expressed concerns about the clarity and objectivity of the requirements and test conditions in FMVSS No. 127 for the FCW audio signal. NHTSA clarifies these requirements by stating the location of the microphone and additional vehicle conditions under which testing will occur, as well as amending the definitions to simplify the requirement for suppression.

Given the above, NHTSA finds that additional comment on the changes herein made in response to petitions for reconsideration of the May 2024 final rule is unnecessary.

Congressional Review Act

The Congressional Review Act, 5 U.S.C. 801 *et. seq.*, as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. NHTSA will submit a report containing this rule and other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the United States prior to publication of the rule in the Federal Register. This rule does not meet the criteria in 5 U.S.C. 804(2) to be considered a major rule.

V. Regulatory Text

List of Subjects in 49 CFR Part 571

Motor vehicles, Motor vehicle safety, Rubber and rubber products.

In consideration of the foregoing, NHTSA is amending 49 CFR part 571 as set forth below.

PART 571—FEDERAL MOTOR VEHICLE SAFETY STANDARDS

1. The authority citation for part 571 continues to read as follows:

Authority: 49 U.S.C. 322, 30111, 30115, 30117 and 30166; delegation of authority at 49 CFR 1.95.

2. Section 571.127 is amended by:

- a. Removing the definition of “masked threshold” from S4;
- b. Revising S5.1.1(a)(3) and (4), S5.1.1(b)(2), S5.1.3. and S8.3.3(g).

The revisions read as follows:

§ 571.127 Standard No. 127; Automatic emergency braking systems for light vehicles.

* * * * *

S5.1.1. * * *

(a) * * *

(3) The auditory signal as measured adjacent to a 50th percentile male driver’s right ear (tragion) must have an intensity of 15–30 dB above the average noise level inside the vehicle when measured over a 5-second period under the range of test conditions specified in S6, at 100 km/h, with all vehicle openings closed, and all subject vehicle audio and sound-producing systems or functions that are not necessary for performing tests pursuant to the conditions in S6 and the procedures in S7, S8, S9 of this standard set to off.

(4) In-vehicle audio that is not related to a crash avoidance system warning must be muted, or reduced in volume during presentation of the FCW auditory signal to within 5 dB of the average noise level inside the vehicle (as measured in S5.1.1(a)(3)), for the duration of the first between-pulse period of the FCW auditory signal under the range of test conditions specified in S6, at 100

km/h, with all vehicle openings closed, and all subject vehicle audio and sound-producing systems or functions that are not necessary for performing tests pursuant to the conditions in S6 and the procedures in S7, S8, S9 of this standard set to off .

(b) * * *

(1) The visual signal symbol must be located within an ellipse that extends ± 18 degrees vertically and ± 10 degrees horizontally of the driver forward line of sight based on the forward-looking eye midpoint (M_f) as described in S14 of 49 CFR 571.111.

* * * * *

S5.1.3. Performance test requirements. The vehicle must provide a forward collision warning and subsequently apply the service brakes automatically such that the subject vehicle does not collide with the lead vehicle when tested using the procedures in S7 under the conditions specified in S6. The forward collision warning is not required if adaptive cruise control is engaged.

* * * * *

S8.3.3. * * *

* * * * *

(g) Two vehicle test devices are secured in stationary positions parallel to the intended travel path. The two vehicle test devices face the same direction as the intended travel path. One vehicle test device is directly behind the other separated by 1.0 ± 0.1 m. The frontmost plane of the vehicle test device furthest from the subject vehicle is located 1.0 ± 0.1 m from the parallel contact plane (to the subject vehicle's frontmost plane) on the pedestrian test mannequin. The left side of each vehicle test device is no less than 2.2 m to the right of the vertical plane through the intended travel path. The left side of each vehicle test device is no less than 1.15 m to the right of the vertical plane parallel to the plane through the intended travel path tangent to the 0 percent overlap point.

* * * * *

Issued in Washington, D.C., under authority delegated in 49 CFR 1.95 and 49 CFR Part 501.

Jack Danielson
Executive Director

[FR Doc. 2024-27349 Filed: 11/25/2024 8:45 am; Publication Date: 11/26/2024]