March 24, 2026

National Highway Traffic Safety Administration
Jonathan Morrison
Administrator
1200 New Jersey Ave SE
Washington, D.C. 20590

[Docket No. NHTSA-2026-0133]

Dear Mr. Morrison:

The Alliance for Automotive Innovation ("Auto Innovators")[1] appreciates the opportunity to submit comments to the National Highway Traffic Safety Administration's (NHTSA) request for comment (RFC) on vestigial vehicle safety regulations.[2]

Taking into consideration DOT's regulatory reform objectives, Auto Innovators' recommendations relate to the federal motor vehicle safety standards (FMVSS) and regulations that no longer reflect current technology, design practices, or safety evidence, and where modernization would maintain or improve safety outcomes while supporting innovation and compliance. These expand on many of the actions we suggested in our response to the Department of Transportation's Regulatory Reform Request for Information last year.[3] The two trade associations that preceded Auto Innovators, the Alliance of Automobile Manufacturers and the Association of Global Automakers, responded to a similar regulatory review exercise in 2017.[4] Auto Innovators continues to request NHTSA reconsider all relevant areas of those responses for deregulatory action, many of which are re-emphasized in this document.[5,6] To assist in identifying test procedure- specific areas for modernizing standards, NHTSA should also consider Auto Innovators' response[7] to NHTSA's 2020 ANPRM[8] efforts to identify and

[1] Auto Innovators represents the full auto industry, including the manufacturers producing most vehicles sold in the U.S., equipment suppliers, battery producers, semiconductor makers, technology companies, and autonomous vehicle developers. Our mission is to work with policymakers to realize a cleaner, safer, and smarter transportation future and to ensure a healthy and competitive auto industry that supports U.S. economic and national security. Representing over 5 percent of the country's GDP, responsible for supporting nearly 11 million jobs, and driving $1.5 trillion in annual economic activity, the automotive industry is the nation's largest manufacturing sector.

[2] https://www.federalregister.gov/documents/2026/01/23/2026-01272/request-for-comment-on-vestigial-vehicle-safety-regulations

[3] https://www.regulations.gov/comment/DOT-OST-2025-0026-0798

[4] https://www.federalregister.gov/documents/2017/10/02/2017-21101/notification-of-regulatory-review

[5] https://www.regulations.gov/comment/DOT-OST-2017-0069-2700

[6] https://www.regulations.gov/comment/DOT-OST-2017-0069-2772

[7] https://www.regulations.gov/comment/NHTSA-2020-0109-0008

[8] https://www.federalregister.gov/documents/2020/12/10/2020-27001/federal-motor-vehicle-safety-standards-test-procedures

resolve FMVSS test procedures that are candidates for replacement, repeal, or modification for conventional non-ADS equipped vehicles.

Members of Auto Innovators are committed to improved safety on our nation's roadways. Importantly, the identification and removal or modification of vestigial requirements need not compromise motor vehicle safety. In many cases, eliminating obsolete or misaligned provisions can enhance safety by allowing manufacturers to focus engineering resources on higher-risk areas and more effective safety innovations, consistent with the intent of the National Traffic and Motor Vehicle Safety Act.[9]

In evaluating potential vestigial requirements, NHTSA should prioritize areas where existing provisions no longer reflect current vehicle architectures, sensing technologies, electric vehicle (EV) powertrains, advanced restraint systems, or automated driving system (ADS) capabilities. When NHTSA is considering priority areas to modernize, the agency may want to employ a top-down methodological strategy that includes a full understanding of both current and emerging fleet capabilities and equipment. The agency would then be better positioned to update regulations to account for mixed fleets (including legacy vehicles and powertrains, transitional vehicles, electric vehicles, and partially and fully automated driving systems) strategically.

In many instances, legacy prescriptive test procedures or hardware-specific requirements were developed to address safety challenges using technologies available at the time. Today, equivalent or superior safety outcomes can often be achieved through performance-based approaches that better align with modern engineering practices. Where dynamic performance requirements have superseded earlier static or component-level tests, NHTSA should consider whether redundant provisions remain necessary.

Importantly, the modernization or removal of outdated provisions should not only be viewed as deregulatory in nature, but also as an opportunity to strengthen regulatory efficiency, improve clarity, increase the extensibility of the current regulatory regime, and enhance enforceability. Clear, technology-neutral performance standards ensure that safety objectives remain fully satisfied while providing manufacturers with flexibility to innovate.

Auto Innovators encourages NHTSA to undertake this review using a transparent, data-driven process that considers real-world crash outcomes, advances in safety science, and the increasing integration of software-defined vehicle systems. By doing so, the Agency can ensure that the FMVSS framework continues to promote innovation, support U.S. competitiveness, and deliver cost-effective and measurable safety benefits for the driving public.

The next section offers the highest priority actions NHTSA can take to modernize vestigial regulations, remove barriers to innovation, and reduce costs. The section following includes some general practices Auto Innovators recommends as ways to identify vestigial regulations more regularly over time.

[9] https://www.govinfo.gov/content/pkg/STATUTE-80/pdf/STATUTE-80-Pg718.pdf

High-Priority Modernization Opportunities and Responses to RFC Questions

Auto Innovators identified several near-term modernization opportunities that warrant prompt agency attention. These areas reflect high-impact regulatory provisions where clarification, amendment, or completion of pending actions could meaningfully improve regulatory predictability and technological alignment while maintaining or enhancing safety outcomes. The priorities below are intended to complement the comprehensive inventory in Appendix A and to highlight opportunities where timely action would provide immediate safety, cost, and compliance benefits. In addition, we have outlined a comprehensive set of proposed changes for FMVSS No. 108 in Appendix B and interpretations the agency should focus on responding to in Appendix C.

1. Priority Regulatory Modernization Areas

In addition to the general practices described above, Auto Innovators urges NHTSA to prioritize a small set of high-impact, near-term modernization actions where regulatory relief can be provided without diminishing safety outcomes. These include:

1. Issuing the planned Notice of Proposed Rulemaking (NPRM) to amend FMVSS No. 127[10] or otherwise revising the standard to address the urgent concerns outlined in Auto Innovators' petition[11] to the final rule;
2. Issuing an interim final rule (IFR)[12] that reflects lead time and other concerns outlined in Auto Innovators' petition for reconsideration[13] on seat belt reminder systems in FMVSS No. 208;
3. Repealing Part 581 requirements or otherwise facilitating increased alignment with related international standards;
4. Reconsidering the agency's proposed approach in the FMVSS No. 228 NPRM[14] to more closely align with GTR No. 9;
5. Issuing the planned NPRM responses to amend[15] and modernize[16] FMVSS No. 108, along with amending the standard to accommodate adaptive driving beams (ADBs) as outlined in Auto Innovators' petition[17];
6. Updating FMVSS No. 208 to either remove the unbelted testing requirements or otherwise provide alternative compliance testing options that incorporate innovative safety technologies (e.g., seat belt assurance systems); and
7. Revising FMVSS No. 111 to explicitly permit Camera Monitoring Systems (CMS) as a compliance option in lieu of conventional mirrors.

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[10] https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202504&RIN=2127-AM69
[11] https://www.autosinnovate.org/posts/agency-comments/petition-for-reconsideration-on-aeb-rule
[12] https://www.reginfo.gov/public/do/eoDetails?rrid=1299514
[13] https://www.regulations.gov/document/NHTSA-2024-0071-0006
[14] https://www.federalregister.gov/documents/2024/09/19/2024-20653/federal-motor-vehicle-safety-standards-pedestrian-head-protection-global-technical-regulation-no-9
[15] https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202504&RIN=2127-AL95
[16] https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202504&RIN=2127-AM70
[17] https://www.regulations.gov/comment/NHTSA-2022-0013-0013

We applaud NHTSA's recent action regarding the Rear Seat Belt Reminder System rule[18] and the agency's decision to respond to petitions for reconsideration by issuing an interim final rule (IFR) as opposed to an NPRM. The delay in issuing a final rule has resulted in ongoing regulatory uncertainty; we are hopeful that the scheduled IFR[19] will address ongoing lead time concerns before the September 1, 2026, compliance date. Auto Innovators urges the Department to publish this action expeditiously to minimize further regulatory uncertainty.

2. Descriptions of Supporting Appendices

This document contains several Appendices with supporting information to assist in the agency's review of FMVSS areas for regulatory updates.

Appendix A provides Auto Innovators' comprehensive inventory of candidate vestigial or misaligned requirements across the FMVSS portfolio. While not exhaustive, Appendix A is intended to be a practical screening tool to highlight provisions that are obsolete, duplicative, overly design-restrictive, or otherwise poorly aligned with modern technology and compliance methods. The intent is to help NHTSA rapidly triage opportunities for clarification, consolidation, modernization, or removal, and to identify issues appropriate for near-term interpretation and/or rulemaking action.

Appendix B provides a deep, issue-by-issue review of FMVSS No. 108 and is offered to assist NHTSA in its efforts to consider a potential negotiated rulemaking or other structured modernization process for the lighting standard.[20] Appendix B focuses on practical opportunities to improve the standard and reduce unnecessary compliance burden while preserving (and in many cases strengthening) real-world safety performance. This Appendix is also intended to complement NHTSA's recent activity and ongoing work related to FMVSS No. 108, including the planned NPRM responses to amend[21] and modernize[22] FMVSS No. 108, along with recommendations for amending the standard to accommodate adaptive driving beams (ADBs) as outlined in Auto Innovators' petition[23]

Appendix C identifies interpretation requests that continue to drive compliance uncertainty, create avoidable design constraints, or require repeated case-by-case engagement.

3. Vestigial Classification Framework

Auto Innovators' classification of vestigial regulations as requested in the RFC are presented below. These categories collectively identify where regulations may no longer reflect current technology, design practices, or safety evidence, and where modernization would maintain or improve safety outcomes while supporting innovation and compliance. Expansive technical details for each FMVSS are presented in Appendix A.

Auto Innovators focused on requirements and test procedures that are obsolete, no longer necessary for motor vehicle safety, and can be removed or modified without compromising that safety. Regulations and requirements indicated in Appendix A are organized by the RFC classification they

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[18] https://www.reginfo.gov/public/do/eoDetails?rrid=1054611
[19] https://www.reginfo.gov/public/do/eoDetails?rrid=1299514
[20] https://www.nhtsa.gov/speeches-and-presentations/2026-SAE-Conference-Keynote
[21] https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202504&RIN=2127-AL95
[22] https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202504&RIN=2127-AM70
[23] https://www.regulations.gov/comment/NHTSA-2022-0013-0013

best illustrate and, in many cases, support more than one category in the agency's input request. The test procedures and other requirements identified here are neither exhaustive nor comprehensive; rather, they indicate the most pressing and immediate opportunities DOT can take to remove vestigial burdens limiting further improvements in vehicle safety and innovation.

a. *Vestigial Classification 1: Require specific hardware or design elements that have been superseded by more effective modern technology.*

These regulations prescribe components, configurations, or architectures that reflect the state of technology at the time the standard was written rather than current best practices and designs. In many cases, newer technologies deliver equal or greater safety performance through different engineering pathways. By locking in specific hardware solutions instead of focusing on performance outcomes, these requirements may inadvertently discourage adoption of more effective modern systems and limit manufacturers' ability to optimize safety using contemporary sensing, computing, or control technologies.

- FMVSS No. 101; *Controls and displays*
- FMVSS No. 102; *Transmission shift position sequence, starter interlock, and transmission braking effect*
- FMVSS No. 104; *Windshield wiping and washing systems*
- FMVSS No. 105; *Hydraulic and electric brake systems.*
- FMVSS No. 108; *Lamps, reflective devices, and associated equipment*
- FMVSS No. 111; *Rear visibility*
- FMVSS No. 113; *Hood latch system*
- FMVSS No. 114; *Theft protection and rollaway prevention*
- FMVSS No. 118; *Power-operated window, partition, and roof panel systems*
- FMVSS No. 124; *Accelerator control systems*
- FMVSS No. 126; *Electronic stability control systems for light vehicles*
- FMVSS No. 127; *Automatic emergency braking (AEB) systems for light vehicles*
- FMVSS No. 135; *Light vehicle brake systems*
- FMVSS No. 201; *Occupant protection in interior impact*
- FMVSS No. 205; *Glazing materials*
- FMVSS No. 206; *Door locks and door retention components*
- FMVSS No. 208; *Occupant crash protection*
- FMVSS No. 209; Seat belt assemblies
- FMVSS No. 214; *Side impact protection*
- FMVSS No. 302; *Flammability of interior materials*
- FMVSS No. 401; *Interior trunk release*
- Part 575; *Consumer information*
- Part 581; *Bumper standard*

b. Vestigial Classification 2: Contain testing procedures that are incompatible with or unnecessarily restrictive for innovative vehicle designs (e.g., vehicles without traditional manual controls).

Many compliance test methods assume traditional driver controls, cabin layouts, and/or mechanical linkages that may not exist in emerging vehicle designs. These are already creating unnecessary barriers for vehicles that rely on alternative control interfaces, automated driving systems, or non-traditional interior configurations. Where test procedures are tied to legacy assumptions rather than functional safety outcomes, they may not accurately evaluate the safety performance of new vehicle architectures and may delay deployment of innovative designs that may improve or are already benefiting real-world safety.

- FMVSS No. 100 series; *Review regulations to accommodate ADS*
- FMVSS No. 102; *Transmission shift position sequence, starter interlock, and transmission braking effect*
- FMVSS No. 104; *Windshield wiping and washing systems*
- FMVSS No. 108; *Lamps, reflective devices, and associated equipment*
- FMVSS No. 111; *Rear visibility*
- FMVSS No. 113; *Hood latch system*
- FMVSS No. 114; *Theft protection and rollaway prevention*
- FMVSS No. 118; *Power-operated window, partition, and roof panel systems*
- FMVSS No. 124; *Accelerator control systems*
- FMVSS No. 127; *Automatic emergency braking (AEB) systems for light vehicles*
- FMVSS No. 135; *Light vehicle brake systems*
- FMVSS No. 201; *Occupant protection in interior impact*
- FMVSS No. 205; *Glazing materials*
- FMVSS No. 206; *Door locks and door retention components*
- FMVSS No. 207; *Seating systems*
- FMVSS No. 208; *Occupant crash protection*
- FMVSS No. 210; *Seat belt assembly anchorages*
- FMVSS No. 214; *Side impact protection*
- FMVSS No. 225; *Child restraint anchorage systems*
- FMVSS No. 303; *Fuel system integrity of compressed natural gas vehicles*
- FMVSS No. 401; *Interior trunk release*
- Part 581; *Bumper standard*

c. Vestigial Classification 3: Impose compliance burdens that do not result in a measurable increase in real-world safety.

Certain regulations impose engineering, certification, or documentation requirements that add unnecessary cost and complexity without clear evidence of corresponding reductions in crashes, injuries, or fatalities. Where regulatory requirements do not demonstrably improve safety outcomes, they divert resources from higher-impact safety innovations and may slow

the introduction of advanced technologies, which increases the costs of new vehicles and delays the widespread introduction of safer equipment.

- FMVSS No. 102; *Transmission shift position sequence, starter interlock, and transmission braking effect*
- FMVSS No. 104; *Windshield wiping and washing systems*
- FMVSS No. 105; *Hydraulic and electric brake systems*
- FMVSS No. 108; *Lamps, reflective devices, and associated equipment*
- FMVSS No. 111; *Rear visibility*
- FMVSS No. 114; *Theft protection and rollaway prevention*
- FMVSS No. 118; *Power-operated window, partition, and roof panel systems*
- FMVSS No. 124; *Accelerator control systems*
- FMVSS No. 127; *Automatic emergency braking (AEB) systems for light vehicles*
- FMVSS No. 129; *New non-pneumatic tires for passenger cars*
- FMVSS No. 135; *Light vehicle brake systems*
- FMVSS No. 141; *Minimum sound requirements for hybrid and electric vehicles*
- FMVSS No. 201; *Occupant protection in interior impact*
- FMVSS No. 202a; *Head restraints*
- FMVSS No. 203; *Impact protection for the driver from the steering control system*
- FMVSS No. 204; *Steering control rearward displacement*
- FMVSS No. 205; *Glazing materials*
- FMVSS No. 206; *Door locks and door retention components*
- FMVSS No. 207; *Seating systems*
- FMVSS No. 208; *Occupant crash protection*
- FMVSS No. 209; *Seat belt assemblies*
- FMVSS No. 214; *Side impact protection*
- FMVSS No. 219; *Windshield zone intrusion*
- FMVSS No. 228; *Pedestrian head protection*
- FMVSS No. 305a; *Electric-powered vehicles*
- FMVSS Nos. 307 & 308; *Fuel system integrity of hydrogen vehicles & Compressed hydrogen storage system integrity*
- FMVSS No. 401; *Interior trunk release*
- FMVSS No. 500; *Low-speed vehicles*
- Part 563; *Event data recorders*
- Part 572; *Anthropomorphic test devices*
- Part 581; *Bumper standard*

d. *Vestigial Classification 4: Act as a barrier to entry for new safety technologies by failing to be technology-neutral.*

Standards that favor specific technical approaches or legacy implementation methods can hinder the introduction of emerging safety technologies that achieve the same or better safety outcomes through different means. Technology-neutral, performance-based requirements

allow manufacturers to meet safety objectives using evolving tools and methods, supporting continuous improvement while maintaining consistent safety expectations. Updating standards to focus on functional performance rather than prescribed technical pathways can help ensure regulations enable - rather than impede – automotive innovation.

- FMVSS No. 102; *Transmission shift position sequence, starter interlock, and transmission braking effect*
- FMVSS No. 104; *Windshield wiping and washing systems*
- FMVSS No. 108; *Lamps, reflective devices, and associated equipment*
- FMVSS No. 111; *Rear visibility*
- FMVSS No. 113; *Hood latch system*
- FMVSS No. 114; *Theft protection and rollaway prevention*
- FMVSS No. 118; *Power-operated window, partition, and roof panel systems*
- FMVSS No. 127; *Automatic emergency braking (AEB) systems for light vehicles*
- FMVSS No. 201; *Occupant protection in interior impact*
- FMVSS No. 205; *Glazing materials*
- FMVSS No. 206; *Door locks and door retention components*
- FMVSS No. 210; *Seat belt assembly anchorages*
- FMVSS No. 214; Side impact protection
- FMVSS No. 226; *Ejection mitigation*
- FMVSS No. 401; *Interior trunk release*
- Parts 541 and 543; *Federal motor vehicle theft prevention standards and exemptions*
- Part 581; *Bumper standard*
- Part 595; *Make inoperative exemptions*
- FMVSS (Various); *Permitting electronic owner's manuals as an alternative to printed manuals*

These classifications provide a structured framework to help NHTSA identify where targeted modernization can reduce unnecessary compliance and cost burdens while preserving or enhancing motor vehicle safety outcomes.

General Practices to Identify Vestigial Regulations

In addition to addressing the high-priority items listed above, specific standards in Appendices A and B, and responses to interpretation requests in Appendix C, NHTSA should consider implementing structure review mechanisms to ensure that vestigial requirements are identified and modernized on a recurring and transparent basis.

1. Periodic review of existing standards and test procedures

NHTSA could establish a recurring and predictable internal review cycle focused specifically on whether regulatory requirements and test procedures continue to serve a functional safety purpose. These efforts should be data-driven, occur at regular intervals (such as every 3 years), and in consultation with a range of stakeholders such as industry and NHTSA research and regulatory contractors and test laboratories. These efforts should be correlated to real world data and outcomes, in order to identify test procedures gaps, inefficiencies, and vestigial provisions.

Such a review cycle could include:

- Identification of provisions that are redundant with newer dynamic or performance-based requirements;
- Evaluations of correlation between prescribed test methods and real-world crash and injury outcomes;
- Assessments of whether hardware-specific design assumptions remain necessary in light of modern vehicle architectures;
- Efforts to incorporate legal interpretations completed since the last review cycle in the official regulatory text to ensure standards clearly communicate and capture those clarifications; and
- Publication of periodic summaries identifying candidate areas for clarification, consolidation, or modernization.

Together, these measures help ensure that existing standards and test procedures will remain aligned with contemporary vehicle technologies and real-world safety outcomes while preserving the core safety objectives of the FMVSS framework.

2. Establish ongoing stakeholder input mechanisms

Beyond petitions, NHTSA could establish more formal mechanisms for accepting public input solely on identifying vestigial requirements. This would allow manufacturers, suppliers, and other stakeholders to flag emerging regulatory mismatches without triggering adversarial or resource-intensive processes.

NHTSA could consider establishing:

- A standing "regulatory modernization" docket updated annually;
- Technical workshops focused on specific FMVSS sections or test procedures; and
- A structured screening framework to distinguish between safety-critical provisions and legacy administrative or duplicative requirements.

Such mechanisms would enhance transparency and regulatory predictability while enabling NHTSA to address vestigial provisions in a proactive and data-informed manner.

3. Comparison with international regulatory activities

NHTSA can further enhance its modernization efforts by systematically evaluating how other regulatory bodies have updated their safety frameworks. International experience may help identify legacy provisions that no longer align with contemporary vehicle architectures, while also highlighting approaches that preserve safety objectives through more durable, technology-neutral language. Input and data from global OEMs and other stakeholders developing and testing vehicles across different regulatory regimes could again be valuable partners in these efforts. Data and recommendations based on global best practices could be shared with NHTSA to discuss, review, and consider ways to better align international performance criteria with the agency's regulatory and safety objectives.

NHTSA could consider looking to existing international regulations and Global Technical Regulations (GTRs) as a useful reference point for identifying requirements that may no longer be necessary. Many international standards have been updated to reflect modern vehicle architectures, software-defined

systems, and performance-based approaches, all while maintaining high levels of safety. Where comparable global requirements demonstrate equivalent or superior safety outcomes with increased flexibility or lower compliance burden, those approaches can provide insight for modernizing FMVSS in a technology-neutral manner. Leveraging international lessons and approaches can help NHTSA avoid duplicative or outdated requirements, support global vehicle platforms, and facilitate the timely deployment of advanced safety technologies for U.S. consumers without compromising safety.

NHTSA could implement a structured benchmarking process comparing FMVSS provisions with UN Regulations (UNR), GTRs, and other widely adopted safety standards to identify areas where:

- Safety objectives are met through alternative, performance-based mechanisms;
- Legacy design assumptions remain embedded in U.S.-specific requirements; and
- Updated international standards better reflect current vehicle technology.

A systematic comparison with international regulatory framework can help NHTSA identify opportunities to modernize legacy standards, reduce unnecessary misalignment, and strengthen the long-term effectiveness of the FMVSS while maintaining positive safety outcomes.

4. Develop more extensible and technology-neutral regulations

NHTSA should consider drafting future regulations in a manner that allows requirements to remain effective as vehicle technologies evolve. Historically, some FMVSS provisions have embedded hardware-specific assumptions or design-based language that reflected the dominant technologies at the time of promulgation. As vehicles increasingly incorporate electrified powertrains, software-defined architectures, advanced sensing systems, and integrated safety functions, overly prescriptive requirements can require repeated amendment to accommodate incremental innovation.

Where feasible, NHTSA could:

- Emphasize performance-based criteria over component- or design-specific prescriptions;
- Use functional definitions that describe the safety objectives rather than the physical mechanism used to achieve them;
- Avoid embedding references to specific actuation methods, materials, or legacy architectures unless demonstrably necessary for safety; and
- Include structured “equivalency” or alternative compliance pathways where comparable safety performance can be objectively demonstrated.

Building extensibility into regulations at the drafting stage can reduce the need for frequent interpretive letters or rulemakings, improve regulatory durability, and ensure that the FMVSS framework continues to support innovation while maintaining robust safety protections.

5. Establish regular review of standards incorporated by reference

Many FMVSS provisions incorporate external consensus standards, technical procedures, and measurement methodologies by reference. Over time, those referenced standards may be revised, superseded, or withdrawn by their originating organizations, creating potential misalignment between federal requirements and current technical best practices.

To promote clarity and consistency, NHTSA could establish a periodic review process to:

- Identify incorporated standards that have been updated or replaced;
- Evaluate whether more recent versions better reflect current safety science or test technology;
- Assess whether maintaining outdated editions creates unnecessary divergence from international or consensus frameworks; and
- Provide structured notice-and-comment opportunities when considering updates.

Regularly reviewing and updating incorporated standards can improve harmonization, reduce duplicative testing burdens, and ensure that federal safety requirements remain aligned with contemporary engineering methodologies without compromising safety outcomes.

Conclusion

Auto Innovators thanks NHTSA for issuing this Request for Comment on vestigial vehicle safety regulations. Auto Innovators and its members welcome the opportunity to provide further technical input to support modernizing outdated provisions while maintaining motor vehicle safety. We appreciate the Agency's focus on identifying legacy requirements and test procedures that no longer serve a functional safety purpose given advances in vehicle design and technology.

We are happy to answer any specific questions related to these recommendations and look forward to continued engagement with the Agency to ensure that safety and innovation co-exist in the U.S. automotive industry. We especially appreciate the Administration's continued efforts to achieve meaningful regulatory burden reduction while continuing to ensure the safety of the U.S. transportation system.

Respectfully submitted,

Sarah Puro
Vice President, Safety and Technology Policy
Alliance for Automotive Innovation

Appendix A:

FMVSS Vestigial Provisions and Modernization Opportunities

Department of Transportation
Request for Comment on Vestigial Vehicle Safety Regulations
"Vestigial Regulations RFC"
[Docket No. NHTSA-2026-0133]

Contents

Appendix A: FMVSS Vestigial Provisions and Modernization Opportunities

FMVSS No. 100 Series; Review regulations to accommodate ADS	
Vestigial Classification	2
Vestigial Determination	NHTSA issued an ANPRM in May 2019 focused on identifying near- and long-term challenges of testing and verifying ADS compliance with existing crash avoidance regulations (FMVSS 100-series).[1]
Recommended Regulatory Action	NHTSA should advance that work to better facilitate technological innovation and support the expedient introduction of ADS technology to the fleet. Appendix 1 of the Alliance's response to the 2017 deregulatory review suggests an initial roadmap detailing potential FMVSS barriers for highly automated vehicles.[2]

FMVSS No. 101; Controls and displays	
Vestigial Classification	1
Vestigial Determination	Certain identification requirements in FMVSS No. 101 related to engine start-stop systems are not harmonized with international symbol standards. Many global markets permit standardized symbols defined in ISO 2575 and incorporated in UN R121, while FMVSS No. 101 may require different identification approaches. This divergence creates unnecessary design and labeling complexity for vehicles offered across multiple markets without providing a demonstrable safety benefit.
Recommended Regulatory Action	Revise engine start-stop identification requirements by allowing compliance with internationally harmonized symbol standards. Permitting ISO 2575 symbols or UN R121 tell-tales as an alternative to current FMVSS No. 101 identification requirements would reduce manufacturing complexity and regulatory divergence while maintaining clear driver information.

[1] https://www.federalregister.gov/documents/2019/05/28/2019-11032/removing-regulatory-barriers-for-vehicles-with-automated-driving-systems

[2] https://www.regulations.gov/comment/DOT-OST-2017-0069-2700

FMVSS No. 102; Transmission shift position sequence, starter interlock, and transmission braking effect	
Vestigial Classification	1, 2, 3, 4
Vestigial Determination	Modern electric vehicle (EV) control strategies provide braking torque through regenerative braking systems that operate independently of transmission gear selection. The transmission braking provisions in FMVSS No. 102 were developed for internal combustion vehicles with mechanical transmissions, where lower gears provided supplemental engine braking at low speeds. In EVs, regenerative braking provides supplemental braking across all operating conditions regardless of gear selection. As a result, applying the legacy transmission braking assumptions in FMVSS No. 102 to EVs (particularly those equipped with multi-speed gearboxes) may unnecessarily constrain regenerative braking strategies and reduce vehicle efficiency without improving safety outcomes. Additionally, certain shift position display provisions reflect earlier assumptions about mechanical shift interfaces and may unnecessarily limit the use of modern digital displays. After a driver's initial observance of the shift mechanism and pattern, the most pertinent information is the selected shift position.
Recommended Regulatory Action	Amend FMVSS No. 102, specifically S3.1.2, to limit applicability of the multi-forward-gear braking provisions to vehicles with transmissions directly coupled to internal combustion engines. Revise the requirements of S3.1.4 to provide increased flexibility for modern digital driver interfaces while maintaining clear communication of shift position to the driver.

FMVSS No. 104; Windshield wiping and washing systems	
Vestigial Classification	1, 2, 3, 4
Vestigial Determination	The standard requires larger windshield wiper sight fields (A/B/C) than necessary for driver visibility, so removal would not reduce traffic safety but would also allow innovative design flexibility. Vehicles are required to be equipped with windshield wipers regardless of whether a windshield is present. This requirement indirectly prohibits vehicles without windshields from being legal in the U.S. market, limiting innovative design solutions.
Recommended Regulatory Action	Align FMVSS No. 104 US sight field requirements with EU Regulation 2021/535 (Annex 4, Fields A/B). Exempt vehicles without windshields from FMVSS No. 104 (as already provided in European standard EU 2021/535). This would not compromise vehicle safety since wipers are ineffective without a windshield.

FMVSS No. 105; Hydraulic and electric brake systems	
Vestigial Classification	1, 3
Vestigial Determination	The standard applies to MPVs, trucks and buses > 3500 kg (7716 lb.). The passenger car references are from a previous version of FMVSS No. 105 that applied to all vehicles prior to the creation of FMVSS No. 135 for all passenger cars. These references in FMVSS No. 105 are now obsolete and, in some cases, differ from the requirements in FMVSS No. 135, creating unnecessary regulatory complexity and potential confusion around the requirements for passenger cars. For example, parking brake systems for passenger cars under S5.2.1 in FMVSS No. 105 must be capable of holding the vehicle stationary on a 30 percent grade, while parking brake systems for passenger cars under S7.12 in FMVSS No. 135 must be capable of holding the vehicle stationary on a 20 percent grade. These references no longer serve a regulatory purpose and should be removed. Several warning and labeling provisions also reflect legacy regulatory approaches that diverge from internationally harmonized practices. The requirement in S5.4.3 for text warnings on brake fluid reservoir caps creates unnecessary complexity across global markets and requires translated labels in jurisdictions with language laws. International standards instead use the ISO brake fluid reservoir symbol specified in UN R13H. Similarly, S5.3.5(a) requires the use of a BRAKE text telltale for brake system warnings. This differs from the ISO brake system symbol used in many other markets, including Canada, resulting in unique instrument cluster configurations for vehicles certified to FMVSS. Several provisions reference vehicles without split service brake systems. Dual-circuit service brakes have been mandatory on new vehicles for decades, making these references obsolete and potentially confusing. These provisions also contain additional warning requirements, including an audible chime and unique warning messaging, which are unnecessary for modern dual-circuit brake systems. Definitions for Anti-lock Braking Systems (ABS), Directly Controlled Wheel, Electrically Actuated Service Brakes, and Regenerative Braking Systems (RBS) are framed around legacy wheel-speed modulation, foundation brake control, and split-hydraulic paradigms. These definitions do not fully reflect modern brake-by-wire architectures or coordinated friction–regenerative braking as an integrated service brake function. Prescriptive burnish, fade, and recovery sequences define detailed conditions for vehicle loading, initial brake temperature (IBT) ranges, run counts, speeds, cooldowns, and friction conditions in detail (OVSC TP-105-03), reflecting legacy friction-only brake paradigms. These fixed sequences may not align with modern blended braking architectures or manufacturer-declared service brake strategies. Stopping tests also require defined Peak Friction Coefficient (PFC) surfaces and tightly controlled lane and path geometries codified in OVSC procedures. These fixed surface certification and layout tolerances may not reflect representative public-road friction conditions.

	Finally, OVSC Laboratory Test Procedure TP-105-03[3] prescribes detailed pre-test checks, instrumentation, run counts, cooldowns, photographic documentation, and legacy data sheets. Subsequent compliance expectations often reflect strict adherence to these procedural elements, increasing cost and administrative burden without altering minimum braking performance outcomes.
Recommended Regulatory Action	Remove the references to passenger cars in FMVSS No. 105 that are now addressed under FMVSS No. 135 and remove references to vehicles without split service brake systems, which have been obsolete since dual-circuit brake systems became mandatory. Replace the brake fluid reservoir text warning requirement in S5.4.3 with the internationally recognized ISO brake fluid reservoir symbol used in UN R13H. Replace the BRAKE text telltale requirement in S5.3.5(a) with the ISO brake system warning symbol to improve harmonization across global markets. Revise S4 definitions to be technology-neutral and function-based (e.g., "a control function that limits wheel slip" regardless of actuation energy path) and explicitly recognize coordinated friction and regenerative braking as a single service brake function. Align terminology with contemporary brake-by-wire and decoupled brake control architectures. Retain minimum stopping performance requirements but allow a technology-neutral burnish/fade protocol that conditions friction linings based on the manufacturer's declared service brake strategy (endurance-based or dyno-based burnish) and allows regenerative braking to operate as in production, with documented worst-case friction duty (e.g., high SoC/regen-off case) tested once rather than through multiple legacy cycles. Allow certification across a validated PFC range representative of public roads and permit blended braking during testing, provided minimum deceleration, stability, and lane-keeping criteria are met. Retain a single worst-case friction-only run to demonstrate friction fallback performance. Permit an equivalency-based compliance pathway allowing manufacturers to submit objective evidence packages (e.g., validated vehicle data logs, traceability of safety requirements, automated data verification) supported by a streamlined on-track test matrix that still demonstrates minimum performance, friction-only fallback capability, and EPB holding performance. Maintain NHTSA's authority to audit and verify compliance as appropriate.

[3] https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/tp-105-03_tag.pdf

FMVSS No. 108; Lamps, reflective devices, and associated equipment	
Vestigial Classification	1, 2, 3, 4
Vestigial Determination	On December 30, 2024, NHTSA denied[4]Auto Innovators' petition[5] to the NHTSA final rule[6] on FMVSS 108 ("Vehicle Lighting"), along with several other petitioners. The unique requirements in many aspects of FMVSS 108 make the standard more complicated than requirements in other markets and does not follow the original Congressional mandate. If not adjusted, parts of this rule stand as an obstacle to the cost-effective deployment of important safety technology in the U.S. market like Adaptive Driving Beams (ADBs). Limiting deployment runs counter to the public's best interest – particularly with respect to affordability, equity and ensuring the technology is more widely accessible to consumers. FMVSS 108 also contains outdated requirements such as for intensity values that make headlamps less effective than they otherwise could be. ADBs minimize "glaring" and should be given higher max intensity thresholds (e.g. UNECE vs. US thresholds).
Recommended Regulatory Action	See Appendix B.

[4] https://www.govinfo.gov/content/pkg/FR-2024-12-30/pdf/2024-31141.pdf
[5] https://www.regulations.gov/comment/NHTSA-2022-0013-0013
[6] https://www.nhtsa.gov/sites/nhtsa.gov/files/2022-02/ADB-Final-Rule-02-01-2022-web.pdf

FMVSS No. 111; Rear visibility	
Vestigial Classification	1, 2, 3, 4
Vestigial Determination	NHTSA issued an ANPRM in 2019 seeking public comment to inform the development of a rule that would support the introduction of camera monitoring systems (CMS) as an alternative to rear view mirrors.[7] Rear view mirrors, as prescribed within regulation, have played an important role in improving safety. However, advancements in vehicle technology present new opportunities to both meet and exceed the existing requirements through the exclusive use of CMS – an approach that is not currently permitted within the standard. NHTSA has already recognized the potential of CMS through the 2019 ANPRM indicating the agency has identified a viable regulatory path to permit these systems as an alternative to mirrors. Cameras can provide equal or better driver visibility, but requirements force manufacturers to keep analogic mirrors, adding cost, drag, and design constraints. In addition, requiring analogic internal rearview mirrors even if the rear window is closed, absent, or does not require rear safety glazing, creates unnecessary and unique burdens in the U.S. market. In certain vehicle designs—such as vehicles with a single seating row and a fixed rear bulkhead or wall—the inside rearview mirror cannot provide any rearward field of view, as it only reflects the interior structure of the vehicle. In such cases, the requirement does not serve its intended safety purpose. FMVSS No. 111 requires the driver's-side outside mirror to be a unit-magnification (flat) mirror, prohibiting convex or aspheric designs. It also requires warning text for convex passenger-side mirrors. This diverges from international practice and limits design flexibility without demonstrated safety benefits. These design constraints diverge from international standards and are not supported by demonstrated safety advantages over alternative geometries. Rear image capture and display requirements in S5.5–S5.7 were developed under legacy assumptions about early backup camera systems. Modern digital camera and display technologies exceed these baseline capabilities, yet the regulation prescribes legacy design constructs that limit flexibility. The standard also does not expressly address driver awareness when reverse is engaged and a rearview image is unavailable, which can result in ambiguous interface conditions, such as a blank display or status message. The execution procedures in S6 were developed for mirror-based systems and include reflection-area checks, positioning/adjustment checks, and mirror-focused photographic documentation. These constructs do not directly translate to camera-based visibility systems.

[7] https://www.federalregister.gov/documents/2019/10/10/2019-22036/federal-motor-vehicle-safety-standard-no-111-rear-visibility

	Mirror stability, adjustability, and related requirements are repeated across multiple sections (e.g., S5.1–S5.4, S6.1, S7.1, S8.1, S11), creating redundancy and interpretive complexity without enhancing safety outcomes. In addition, certain detailed provisions may warrant reevaluation in light of modern vehicle design and international practice. For example, the 400 N detachable force requirement for interior mirrors was developed under earlier safety assumptions and may no longer reflect current restraint system performance or airbag deployment considerations. Requirements governing field-of-view obstructions for mirrors could also be updated to align more closely with international approaches such as UN R46. These issues collectively demonstrate that FMVSS No. 111 retains mirror-based design assumptions and legacy camera provisions that unnecessarily constrain modern visibility technologies and diverge from current international regulatory approaches. Overall, the goals and requirements of FMVSS No. 111 are similar to UN R46 and UN R158. Where differences exist, they are typically negligible from a safety perspective, such as requiring different fields for rearward vision. This indicates greater global regulatory harmonization could be achieved without reducing safety performance. The standard does not currently address operational conditions such as temporary rearview camera system deactivation or trailer attachment, which are accommodated in some international standards. Allowing flexibility in these circumstances could improve system design without affecting safety performance.
Recommended Regulatory Action	Revise FMVSS No. 111 to explicitly permit CMS as a compliance option in lieu of conventional mirrors, provided performance-based visibility criteria are met. Harmonize FMVSS No. 111 with international standards (e.g., UN R46) to allow CMS-only configurations as a compliance option where equivalent or superior visibility performance is demonstrated. In particular, revise S6 to adopt technology-neutral execution procedures that evaluate field-of-view and image performance outcomes. Generally, FMVSS No. 111 could incorporate more aspects of UN R46 or UN R158, harmonize with those standards, or seek more ways to mutually recognize their requirements without any disbenefits to safety. Clarify that the interior mirror requirement does not apply for vehicle configurations with no possible rearward field of view. Update or remove mirror housing durability and mounting provisions that are specific to external mirror assemblies and not applicable to integrated or compact digital camera systems. Replace mirror-specific geometric and curvature requirements in S5.2.1, S5.4.2, S6.1(b), and S7.1 with technology-neutral, performance-based field-of-view and image quality criteria applicable to both optical mirrors and digital systems, without warning text needed. Revise the driver's-and passenger's side mirror requirement to permit convex or aspheric geometries that meet performance-based criteria.

	Update S5.5–S5.7 to adopt technology-neutral, performance-based image quality and field-of-view criteria, allowing modern camera systems to meet or exceed safety objectives without adherence to legacy design constraints. Consider updating those sections to address driver awareness when a rearview image is not displayed while reverse is engaged, without introducing new diagnostic requirements, so the interface does not present an ambiguous condition when the image may be unavailable. Reduce regulatory burden and prescriptive design assumptions by changing the image response time test requirements to better align with UN R158. Specifically, S14.2 (d) should be updated, such as: “Select the vehicle's reverse direction at any time not less than 6.0 seconds after activating the starting system.” This decouples the test procedure from legacy vehicle architectures (door logic, keyed start) that are not related to the safety objective of the rear visibility requirement. Consolidate overlapping mirror requirements into streamlined, performance-based provisions and eliminate duplicative language to improve clarity and reduce regulatory burden. Reevaluate the 400 N detachable force requirement for interior mirrors as this testing may be unnecessary and airbag deployment may cause the mirror to become a dangerous projectile in certain crashes. Allowing other compliance options, such as the UN R46 dynamic pendulum test, would result in a direct reduction in development costs and could even result in improved structural integrity for these components. Requirements for obstructions in the field of view for inner and outer mirrors should be updated to align with international standards like UN R46, which specifies maximum obstruction percentages and better reflect real world driving conditions and safety needs. Revise FMVSS No. 111 to include provisions that permit adaptation or temporary deactivation of the rearview camera upon detecting a trailer attachment, similar to UN R158's allowance (16.1.1.3 Deactivation): "The system may be switched off when the vehicle detects a coupling by means of a coupling device."

FMVSS No. 113; Hood latch system	
Vestigial Classification	1, 2, 4
Vestigial Determination	The current regulation has remained substantively unchanged since its original adoption in 1971, and certain aspects do not reflect contemporary vehicle design practices or safety technologies. All modern passenger vehicles are now equipped with both primary and secondary hood mechanisms as standard production features. Electric vehicle (EV) front trunks (frunks) for example, often use electronic closures, sensors, and software lockouts instead of mechanical latches. EV front panels often weigh less, use different geometries, and/or employ electronics that prevent opening while driving. Two-latch mechanical systems add cost and complexity when electronic interlocks may provide equal or better safety. The definition of "hood" as any movable panel covering the engine, luggage, storage, or battery compartment is also outdated. This is problematic because EVs and advanced vehicles use multi-panel designs, powered frunks, and sensor-controlled access systems. The current definition doesn't fit non-engine-based architectures and forces EV frunks to follow legacy latch rules with no added safety benefits.
Recommended Regulatory Action	Update the requirements in S4.1 and S4.2 to accommodate more modern hood closure technology, reconsidering the requirement to provide a second locking mechanism (or second position). The definition for "hood" in S3 should also be updated. If a regulatory requirement for primary and secondary latch systems remains necessary, it should be updated to apply only to vehicle categories differentiated by specific weight thresholds.

FMVSS No. 114; Theft protection and rollaway prevention	
Vestigial Classification	1, 2, 3, 4
Vestigial Determination	FMVSS No. 114 is written with the assumption that a physical key is removed from the starting system as the primary theft deterrence and rollaway prevention strategy, but most modern vehicles use electronic keys and digital authentication to accomplish this. Prescriptive references to key removal and ignition switch positions create interpretive ambiguities and unnecessary design constraints without advancing the core safety objectives of the standard. Modern immobilizers and encrypted digital keys far exceed the existing test's requirements and offer equivalent or improved theft protection and rollaway prevention versus legacy key-based systems. The safety objectives of theft deterrence and rollaway prevention remain critical; however, the prescriptive architecture no longer reflects modern vehicle

	authentication systems and should be modernized to focus on performance outcomes rather than legacy design assumptions. Additionally, S5.2.5 specifies that when tested in accordance with S6.2.2, each vehicle must not move more than 150 mm on a 10 percent grade when the gear selection control is locked in "Park." Many modern vehicles automatically apply an electronic parking brake (EPB) when shifting to Park, providing secondary protection against vehicle rollaway. The current test procedure assumes manual parking brake application and release and does not fully account for the vehicles that automatically apply the EPB as part of their normal operating strategy. Allowing EPB systems that automatically engage when the vehicle is shifted into Park to remain active during testing would better reflect real-world vehicle operation and support the safety objective of preventing vehicle rollaway. In vehicles where the EPB is automatically applied when shifting to Park, the current test procedure may require the parking brake to be manually released and reapplied, creating a test condition that does not reflect normal vehicle operation.
Recommended Regulatory Action	Update these requirements to better accommodate modern vehicle designs, particularly by revising S5.1.1 to require the vehicle not to move unless a valid electronic credential is present. Replace S5.1 and S5.1.1 with a basic performance rule that vehicles must prevent propulsion system activation or vehicle movement without valid authentication. Modify the S6.2.2 test procedure to allow vehicles that automatically apply the electronic parking brakes when shifted into Park to retain that function during testing. Modify S6.2.2(b) to language such as "Manually apply parking brake if present, if not auto applied when vehicle shifts to park." Modify S6.2.2(e) to language such as "Release parking brake, unless automatically applied by the vehicle in S6.2.2(b). Release the service brakes." These revisions would allow vehicles equipped with automatic EPB systems to be evaluated under test conditions consistent with their normal operation while maintaining the rollaway prevention objective of the standard.

FMVSS No. 118; Power-operated window, partition, and roof panel systems	
Vestigial Classification	1, 2, 3, 4
Vestigial Determination	International regulations such as UN R21 include comparable auto-reversing window safety provisions to FMVSS No 118, suggesting opportunities for regulatory harmonization that reduce manufacturing complexity and cost burdens. Requirements for the key position are outdated. FMVSS No. 118 only allows power-window and/or roof closing when the key is in ON/START/ACC positions. Modern vehicles use digital keys and do not necessarily have these ignition states anymore, which complicates EV and ADAS designs by forcing OEMs to simulate old ignition states. The standard also says a remote device cannot close a window from more than 6 meters away. Modern phones, BLE/UWB keys, and secure apps safely work at longer ranges, so this limit is unnecessary and restrictive. Similarly, the door-open timing rule is outdated. Windows may only close between engine shutoff and opening a front door (for multi-door vehicles), which restricts certain automated systems - like remote ventilation, AV modes, and smart pre-conditioning - that need to operate without a human opening a door. Anti-pinch requirements evaluated by the 4mm rod entrapment test may not fully reflect modern sensing technologies that rely on force sensors, current monitoring, cameras, and/or edge detection to prevent safety issues. The standard still references the infrared reflectance of the test rod used, which is entirely irrelevant to modern electronic anti-trap systems. FMVSS No. 118 also blocks remote closing if the remote is separated from the vehicle by an opaque surface. This was originally intended to ensure the operator-maintained line-of-sight to the window opening during closure. Modern remote window closing systems incorporate anti-pinch protection, force sensing, and in some cases occupant or object detection technologies to prevent injury. These technologies mitigate the safety concerns that originally motivated line-of-sight restrictions, making the requirement unnecessary for many contemporary designs. Several provisions in FMVSS No. 118 assume that window closure occurs through a driver physically present at the vehicle using a mechanical control input, an assumption that does not reflect modern vehicle architectures that rely on authenticated remote devices, digital credentials, and occupant-presence detection. The operating method list (muscle force, exterior lock, etc.) is also outdated and prevents the deployment of innovative window opening technology. By only allowing closure using certain mechanical inputs, modern controls like voice commands, gestures, OTA-controlled closures, smart UI, or fleet-level automation are limited.

	The test procedure (TP-118-06)[8] reflects legacy window control activation methods based on mechanical switch inputs (e.g., interior window switches or exterior key-operated closing). These assumptions do not align well with modern control architectures such as capacitive controls, smartphone-based commands, gesture controls, or app-based remote operation. Additionally, S4(f) references S5(b), which was removed in a 1994 revision of FMVSS No. 118. The remaining reference creates an outdated cross-reference in the regulation and should instead reference S7.1, which contains similar provisions.
Recommended Regulatory Action	Consider including a compliance option in FMVSS No. 118 to meet comparable UN R21 auto-reversing window safety provisions. Update requirements in S4(a) to allow other vehicle ignitions states. Revise S4 operating provisions to remove prescriptive assumptions that widow closure is initiated by a driver physically present at the vehicle, and instead allow operation through authenticated remote devices or automated vehicle control systems, provided all anti-entrapment protections remain active. Expand the remote closing distance allowance in S4(d). Change the outdated door open timing requirements in S4(e) or offer an alternative compliance option with UN R21 5.8.3 auto-reversing requirements. Evaluate whether the 4mm rod test in S4(f) remains the most appropriate technology-neutral method for verifying anti-pinch performance or offer a compliance option for vehicles that meet UN R21 5.8.3 auto-reversing requirements. Eliminate references in S3 to the infrared reflectance of the test rod. Eliminate the opaque surface limitations in S4(g). Expand the list of operating methods in S4(b)-S4(c) Redesign TP-118-06 to better reflect modern technology and approaches. Update S4(f) to replace the obsolete reference to S5(b) with a reference to S7.1.

[8] https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/tp-118-06_tag.pdf

FMVSS No. 124; Accelerator control systems	
Vestigial Classification	1, 2, 3
Vestigial Determination	FMVSS No. 124 was designed to ensure that mechanical accelerator control systems returned to idle when released by the driver or otherwise disconnected. Since the final rule was promulgated in the 1970s, the fundamental underlying technology has dramatically changed. As NHTSA acknowledged in its withdrawn[9] NPRM[10]on the standard, nearly all vehicles required to comply with that standard use sensors and electronic control systems to ensure safe operation, making many of the mechanical requirements of FMVSS No. 124 overly burdensome.[11] It does not account for newer technology and creates unnecessary compliance costs without public benefits. There is a lack of explicit coverage for software and/or system faults in systems employing electronic throttle control (ETC). FMVSS No. 124 is highly focused on mechanical severance but silent on software and/or system level faults that matter most in ETC. NHTSA's functional safety assessments of gasoline, diesel, and fuel cell systems acknowledge the agency can evaluate ETC from a safety perspective, but these insights have not been translated into requirements. The use of "single idle indicant" as a method for compliance is another FMVSS No. 124 legacy practice that does not reflect a safety need. With coordinated ETC control, no one parameter reliably indicates actual drive torque at the wheels; a system may adjust airflow while torque is still bounded or vice versa. NHTSA's 2012 NPRM contemplated alternative indicants (e.g., creep speed) but was withdrawn, leaving the acknowledged regulatory gap in place. The regulation also defines fuel metering device as the carburetor (or injectors) and throttle as the component of that device; the idle position is where the throttle first contacts an engine idle control. EVs are unnecessarily restricted by having to redefine throttle and idle as motor controller and motor shutdown, respectively. The "return to idle" requirements are also no longer useful for safety evaluations, as were discussed in the 2012 NPRM and emphasized in OEM feedback to the proposal. Idle time is a poor proxy for stopping drive torque in ETC, HEV, and EV powertrains. Engine running conditions are inapplicable or awkward for BEVs and have required the agency to issue interpretations around non start conditions after cold soak. The 12-hour soak adds testing costs but does not target the actual torque response risks relevant to ETC or EV systems. The requirement that one component of the accelerator control system disconnected or severed at a single point must still return to idle are also unnecessary for safety. For ETC, the critical risk is incorrect torque delivery from

[9] https://www.federalregister.gov/documents/2019/05/14/2019-09820/federal-motor-vehicle-safety-standards-accelerator-control-systems

[10] https://www.federalregister.gov/documents/2012/04/16/2012-9065/federal-motor-vehicle-safety-standards-accelerator-control-systems

	electrical faults, sensor disagreements, or software and electromagnetic compatibility anomalies, not a snapped cable as the regulation assumes. A mechanical severance scenario often does not represent the highest risk failure modes in modern architectures. The 2012 NPRM proposed adding ETC-specific disconnection failure modes and indicants, implicitly recognizing the mismatch. The accompanying test procedure, TP 124 06, contains artifacts (e.g., cold soak duration, engine running constraint, associated documentation burdens, and chamber time and run conditions) that operationalize outdated idling and engine constructs rather than delivered torque outcomes. It also compels chamber time and run conditions that aren't representative of BEVs and HEVs or modern torque management techniques.
Recommended Regulatory Action	Revise the outdated rule to better align with modern technology while preserving safety. Consider repeal or consolidation into broader performance-based controls requirements to avoid technology-limiting provisions while preserving unintended acceleration mitigation objectives. To better accommodate ETC systems, ETC safety case expectations and fault injection performance testing (aligned to ISO 26262) should be incorporated into FMVSS No. 124 or a companion guidance document. This should be coupled with brake throttle override (BTO) effectiveness checks. The agency has already noted BTO is widespread, which supports codifying outcome-based checks rather than requiring prescriptive BTO designs. Revise the standard to focus on delivered torque (preferably axle torque) or vehicle low speed/creep cap as the compliance variable, and, where applicable, calculated engine load as practical standardized outputs. Change the carburetor-centric definitions in S4, S4.1, and S 4.2 from "throttle/idle" to delivered propulsion torque or axle/wheel torque to reflected modern vehicle architecture. Shift S5.2 to assess fault-injection-based performance checks (e.g., sensor open/short, stuck bit, power supply brownout, CAN bus error) with a torque-at-wheels bound and BTO override effectiveness, which mirrors NHTSA's own ETC safety assessments." Replace S5.3 and the S5 preamble "return to idle" requirements with a performance envelope on decay of delivered wheel/axle torque after pedal release under defined ambient ranges (including thermal preconditioning) with technology neutral acceptance criteria (e.g., torque % of GVW·g, creep speed cap, or stopping distance with BTO applied). Revise TP-124-06 to remove outdated artifacts and allow technology appropriate precondition (battery/thermal), require fault injection for common ETC failure modes, and measure torque/creep speed/BTO stopping outcomes rather than "idle indicant" timing."

FMVSS No. 126; Electronic stability control systems for light vehicles	
Vestigial Classification	1
Vestigial Determination	FMVSS No. 126 includes definitions and constructs for yaw-rate determination, side-slip estimation, low-range 4WD, Ackerman steering angle, etc., that implicitly assume mechanical steering linkages and fixed driveline configurations. Modern vehicle architectures – including steer-by-wire, torque vectoring, decoupled-or on-demand AWD (including EV-AWD), dual-motor EV systems, and predictive chassis control - do not map cleanly to these legacy mechanical constructs. As a result, manufacturers must interpret or artificially conform advanced control systems to definitions that were developed for fixed mechanical architectures. Additionally, certain terms and test assumptions do not explicitly address vehicles with decoupled driveline states, regenerative braking coordination, or one-pedal driving (OPD) torque blending strategies, creating uncertainty as to the appropriate evaluation method under dynamic stability testing. These definitional artifacts do not undermine the core safety objectives of electronic stability control, but they constrain regulatory clarity and flexibility for modern vehicle platforms and may introduce unnecessary compliance complexity without a corresponding safety benefit. Overall, the goals and requirements of FMVSS No. 126 are similar to UN R140. Where differences exist, they are typically negligible from a real-world safety perspective, such as for the waiting time between required test runs.
Recommended Regulatory Action	Review and update definitions in S4 to remove implicit assumptions regarding mechanical steering linkages, fixed driveline configurations, and continuous physical coupling between steering input and wheel angle, and revise terminology to accommodate steer-by-wire, torque-vectoring, and software-defined chassis systems. Clarify applicability and test interpretation provisions to ensure consistent evaluation of vehicles equipped with decoupled or on-demand AWD (including EV-AWD), dual-motor EV architectures, regenerative braking coordination, and one-pedal driving (OPD) strategies. Modernize references to driveline states and control strategies to ensure ESC compliance is evaluated based on vehicle-level dynamic stability performance outcomes, rather than prescriptive mechanical constructs that do not reflect contemporary vehicle architectures. FMVSS No. 126 could incorporate more aspects of UN R140, harmonize with that standard, or seek more ways to mutually recognize its requirements without any disbenefits to safety. In particular, the agency should consider allowing simulated ESC tests and updating the maximum steering angle to 98 percent of the maximum operable angle if the maximum steering angle is less than 270 degrees.

FMVSS No. 127; Automatic emergency braking (AEB) systems for light vehicles	
Vestigial Classification	1, 2, 3, 4
Vestigial Determination	NHTSA issued a final rule mandating Automatic Emergency Braking (AEB) and Pedestrian Automatic Emergency Braking (PAEB) in new vehicles beginning in 2029.[12] The related Congressional mandate[13] only required Forward Collision Warning (FCW) and Automatic Emergency Braking (AEB) systems, but NHTSA also issued requirements for the much more technologically challenging and costly PAEB systems. Rather than leverage a voluntary commitment[14] automakers made to NHTSA in 2016 to deploy AEB technology, the final rule mandates technology that is inconsistent with regulations implemented in other parts of the world and likely to result in aggressive and unpredictable braking that will frustrate drivers. Requiring the vehicle to stop from extremely high speeds to meet compliance requirements may be in conflict with real-world scenarios and risks secondary collisions due to unnecessary activation. Auto Innovators filed a petition for reconsideration[15] in June of 2024, and subsequently challenged the rule in the D.C. Circuit. In its status report to the court on Feb. 5, 2026, NHTSA indicated its intention to promulgate future rulemaking to address at least some of the concerns outlined in the litigation.
Recommended Regulatory Action	Revise rule to meet intent of Congressional mandate and align requirements with current system capability and technology maturity at a reasonable cost when compared to the expected public benefits. Codifying the requirements of the voluntary commitment would have met the statutory intention of with no cost to industry or consumers for net positive safety benefits. Harmonizing FMVSS No. 127 with R152 would result in improved performance over the voluntary commitment while also keeping costs down.

[12] https://www.nhtsa.gov/sites/nhtsa.gov/files/2024-04/final-rule-automatic-emergency-braking-systems-light-vehicles_web-version.pdf

[13] Section 24208 of Public Law No. 117-58 https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf

[14] https://www.nhtsa.gov/press-releases/nhtsa-announces-update-historic-aeb-commitment-20-automakers

[15] https://www.autosinnovate.org/posts/agency-comments/petition-for-reconsideration-on-aeb-rule

FMVSS No. 129; New non-pneumatic tires for passenger cars	
Vestigial Classification	3
Vestigial Determination	FMVSS 129 regulates a type of equipment (non-pneumatic spare tires) that is not widely available in the light vehicle fleet. This creates a regulatory obligation with no safety benefit. It may also inadvertently limit the innovation of new equipment. Emerging non-pneumatic tire technologies under development are intended for primary vehicle use rather than spare applications.
Recommended Regulatory Action	Rescind or consolidate the rule to reduce compliance costs and remove unnecessary requirements. Consider a review of the rule to determine whether future non-pneumatic tires intended for primary vehicle use would require a distinct, performance-based regulatory framework tailored to full-time operational characteristics, rather than reliance on provisions originally developed for limited-use spare tires.

FMVSS No. 135; Light vehicle brake systems	
Vestigial Classification	1, 2, 3
Vestigial Determination	FMVSS No. 135 establishes requirements for braking systems. Despite recent updates, the regulation does not address fully brake-by-wire systems. As this technology represents a significant innovation, other markets—including UNECE and China—are introducing dedicated requirements for such systems. Currently, US regulations lack specific provisions for both steer-by-wire and brake-by-wire systems, requiring case-by-case compliance discussions between manufacturers and authorities. This results in increased effort and regulatory burden for both parties. The wording for requirements under S5.1.3(a)–(b) biases legacy control topologies, complicating adoption of distributed/centralized control and next-generation in-wheel or e-axle architectures—without an evident safety gain if wheel-slip is controlled and pedal feel/deceleration meet S7 requirements. When RBS are part of the service brake system, they must be automatically activated via the pedal, not driver-disconnectable, and coordinated with ABS control if ABS-equipped. This may limit the design of modern EV brake blending, which typically uses a supervisory torque allocator that schedules hydraulic and motor braking together; wheel-slip control can be coordinated among ESC/ABS and powertrain controllers rather than "ABS controlling RBS" in such a narrow sense. The parking brake provision in S5.2 is based on an antiquated braking standard developed at a time when total brake system failure was a relatively common occurrence. Originally developed to address both hill holding and emergency stopping, the standard required the parking brake system to be of a "friction type." The "friction type" specification was established to ensure the parking brake

	(provided to prevent vehicle roll-away) could also be used to stop the vehicle in an emergency. This language excludes non-friction, non-mechanical holds (e.g., motor torque parking, brake-by-wire static hydraulic/electric clamping without a mechanical pawl, or redundant park-lock concepts integrated into e-axles). Emergency stopping functionality is also provided today via electronic stability control (ESC) systems.[16] There is a reduced need for the parking brake to play a role in emergency stopping and no need for the design of a parking brake to be restricted to a "friction type." If this obsolete "friction type" provision was deleted, manufacturers would be free to implement even more robust and reliable parking brakes. Absent the "friction type" provision, modern solutions (e.g., double locking gear systems) could be implemented. Such systems have the added safety advantage of not being susceptible to extreme temperature, usage, or environmental conditions (e.g., ice buildup). For EV architectures with strong fail-safe power management and redundant actuation, a non-friction static hold with proper diagnostics and energy-reserve provisions could meet or exceed roll-away risk targets; however, S5.2 prevents certifying such designs. The "friction + solely mechanical retention" language excludes non-friction, non-mechanical holds (e.g., motor torque parking, brake-by-wire static hydraulic/electric clamping without a mechanical pawl, or redundant park-lock concepts integrated into e-axles). The labeling requirements in S5.4.3 impose region-specific cap marking distinctions (e.g., ISO-symbol-based versus text-based brake fluid reservoir caps) that do not materially affect brake system safety or fluid compatibility. Requiring separate cap variants for different jurisdictions increases part complexity, validation burden, and manufacturing coordination without a corresponding safety benefit. The brake system indicator lamp provisions also retain legacy requirements that no longer reflect modern braking system design. S5.5.5(b) requires text-based telltales such as "BRAKE," while many other markets, including Canada, permit ISO brake warning symbols. In addition, S5.5 retains references to vehicles manufactured without split service brake systems, even though dual-circuit brake systems have been mandatory for decades. Together, these provisions create unnecessary instrument cluster complexity and warning requirements without a corresponding safety benefit. The requirements in S6.2.1 specify the road test surface must produce PFC 1.02 using an ASTM reference tire/protocol. A single, very-high-μ surface is useful for repeatability but does not represent the breadth of real pavements and μ distributions. It pushes brake sizing and balance toward a specific track μ, which can encourage over-optimization to the test surface. Many modern ESC/ABS/blending algorithms adapt across μ. Functional-safety objectives (stopping within distance under given pedal effort) can be achieved across a μ corridor with correction factors without locking the test to one expensive, tightly maintained surface specification.

[16] https://www.law.cornell.edu/cfr/text/49/571.126

	Studies also show that modern pads/rotors stabilize well before the 200 stops required by S6.3.4, which increases test burden with no safety benefit given modern brake material characteristics. FMVSS No. 135 also retains legacy references to proportioning valves and variable brake proportioning system functional failure. In modern brake systems, vehicles equipped with ABS manage Electronic Brake Force Distribution (EBD) through electronic brake booster or related control modules. As a result, the S7.9 Variable Brake Proportioning System Functional Failure test may be duplicative of the S7.11 Brake Power Unit or Brake Power Assist Unit Inoperative test and may no longer reflect contemporary brake system design. In the current OVSC Form 135, OEMs must provide a procedure to disconnect batteries from propulsion motor(s) for S7.7(h) "Stops with engine off" tests and to render RBS inoperative. The requirement to physically disconnect propulsion batteries to demonstrate compliance reflects internal combustion engine assumptions and does not reflect modern EV architectures.
Recommended Regulatory Action	Introduce dedicated requirements to address brake-by-wire systems, ideally aligned with international standards (e.g., UN R13H). This would facilitate safer, more efficient and harmonized technology while reducing compliance burden. Update to S5.1.3(a)–(b) to a performance-based mandate, such as: "During brake blending, wheel slip shall remain within ESC/ABS-specified limits under all S7 conditions," allowing control architecture that demonstrates compliant slip control and pedal fidelity to meet compliance. Update FMVSS's parking brake requirements by removing the requirement in Section 5.2 which requires the parking brake to be of a "friction type." Allow performance-based alternatives: a parking-hold function that maintains immobilization on prescribed grades for specified durations without solely mechanical retention, if it demonstrates fail-safe behavior under single-point electrical/energy failures equal to or better than current friction-mechanical systems. In the interim, AFAI recommends NHTSA respond to the interpretation request on this matter, which was filed by Porsche Cars North America, Inc. on January 12, 2024. A copy of the Porsche request for interpretation is in Appendix C. Amend S5.4.3 to permit compliance through either text-based or ISO-symbol-based brake fluid reservoir cap markings (FMVSS No. 125, UN R121, or ISO 2575), provided the marking clearly communicates fluid specification and compatibility. Amend S5.5.5(b) to permit ISO symbol-based brake telltales in place of text telltales such as "BRAKE" and remove legacy references in S5.5 to vehicles manufactured without a split service brake system. Revise S6.2.1 to permit a μ corridor (e.g., PFC 0.95–1.05) with tire-force normalization or allow two surfaces (high- and mid-μ) and compute an equivalency-corrected stopping metric, preserving safety comparability while lowering recurring costs. Replace the fixed "200 stops" requirement in S6.3.4 with a convergence-based burnish: proceed once deceleration vs. pedal-force and pad μ stabilize within a tight

	tolerance across N successive stops, with an upper cap around 60–80 stops. Alternatively, reference UN R13H Annex 3 burnish or allow dyno pre-conditioning equivalency for production friction formulations. The agency can also retain the right to conduct the full burnishing regimen if stabilization isn't demonstrated. Remove legacy references to proportioning valves and revise or remove the S7.9 Variable Brake Proportioning System Functional Failure test where it is duplicative of S7.11 for vehicles using ABS/EBD-based brake force distribution. Update the current OVSC Form 135 for S7.7 (h) purposes to define a standardized EV propulsion-off state (e.g., specific CAN states, inverter inhibit) that preserves brake controller power and/or diagnostics while removing traction torque, with no high voltage manual disconnects required.

FMVSS No. 141; Minimum sound requirements for hybrid and electric vehicles	
Vestigial Classification	3
Vestigial Determination	No updates to the sound level requirements are necessary; however, there are areas of improvement needed to ensure compliant vehicles are not erroneously deemed non-compliant and therefore subjected to unwarranted enforcement. Likewise, these improvements would also assure that non-compliant vehicles are not wrongfully deemed compliant. The current test procedures result in measurement uncertainty significantly in excess of values forecast by NHTSA. Updating the test procedures to align with ISO 16254:2024 will help reduce measurement uncertainty and bring test reproducibility closer to the levels anticipated by NHTSA in the original publication of FMVSS No. 141. In addition, where NHTSA chose to deviate from SAE and ISO requirements on assessment of the background noise of a test facility, alignment with the current requirements of SAE J2889/1 and ISO 16254 should be pursued. Other regulatory bodies, most notably WP.29, have recognized these issues and have updated UN R138 accordingly with the latest technical methods contained in ISO 16254:2024. Once the technical test methods are updated to provide objective, repeatable, and reproducible test procedures, the technical calculations related to the following performance specifications can be improved to align with the results provided by the correct technical test methods. Examples of calculations are as follows: Relative Volume provision in S5.4: • Relative Volume was chosen as a substitute for the Frequency Shift provisions of SAE J2889/1 and ISO 10844. As the frequency bands incorporated in the calculation of relative volume include bands with only background noise, the relative volume provision is not objective and can result in compliance outcomes that do not necessarily correspond to meaningful detectability improvements. Selection of frequency bands to fulfill S5.2:

	• The original development of "Two band sound" requirements occurred at part of the WP.29 QRTV working group under GRB prior to development of FMVSS 141. The concept was to provide the necessary safety detection sound, and to do so with redundancy (the reason for two bands, not just one). It was recognized that the requirements needed to account for age related hearing loss typical in populations. Therefore, the requirement was that only one of the bands could be at or above 1600Hz. The corollary is that having two bands below 1600Hz will be a safety benefit for persons with high frequency hearing loss. However, in the original FMVSS 141 this human hearing understanding was mistakenly expressed as the need to have both a high frequency and a low frequency band with safety signal energy. There is no safety reason to require a high frequency band; it is only necessary to ensure that not all safety sound is generated in these high frequency bands. The final technical item to be improved is the update of the ISO standard referenced in S6.2 to permit the use of the latest versions of ISO 19844. In addition to the priority technical improvements necessary, there are administrative and interpretation improvements which will allow for safety benefits to be realized and not constrain manufacturers in the design of systems to realize these benefits. The current sameness provision in S5.5 limits system integration flexibility and stifles innovation. OEMs are unable to make running changes to improve systems, or combine horns and Acoustic Vehicle Alerting Systems (AVAS). Currently, S5.5.1 and S5.5.2 forbid vehicles from varying AVAS sounds through different driving modes, despite there being no safety reason for prohibition as long as all modes meet the requirements. This hampers design flexibility and innovation and limits consumer choice. Identical vehicles may be equipped with optional external sound systems and have different numbers and locations of loudspeakers. Supply chain issues in recent years, including chip shortages and rare earth magnet availability, have raised additional compliance concerns. By disallowing variations in hardware across model lines, manufacturers may be constrained to technologies at risk of limited supply, which stifles innovation without safety benefits and jeopardizes the ability to ensure manufacturers can produce vehicles compliant with FMVSS No. 141. Unlike UN R138, FMVSS No. 141 does not contain an allowance for alternative backup sounds unless a given vehicle is classified as a unique trim variant. This places unnecessary constraints on manufacturers of products that span consumer and industrial markets without improving safety; in fact, safety may be enhanced through the use of more recognizable backup sounds. An existing interpretation[17] allows a user-activated horn and the pedestrian alert sounds to share a common speaker system. However, that interpretation is limited since it is based on one manufacturer's described design.

[17] https://www.nhtsa.gov/interpretations/571141-ncc-230601-001-nagaraj-superhorn

Recommended Regulatory Action	NHTSA should consider incorporating into FMVSSS No. 141 some of the latest technical improvements from ISO 16254[18] (and SAE J2889-1[19], when updated) regarding microphones and signal processing to reduce the measurement uncertainty. In addition, the background noise qualification criteria of FMVSS 141 should be updated to align with SAE J2889/1 and ISO 16254. NHTSA should also update the referenced standards in S6.2 to the latest ISO 10844 version. NHTSA should amend the rule to include an optional compliance provision similar to the 1/3rd octave band definition in UN R138.01, Chapter 6.2.1.2: " When tested under the conditions of Annex 3 paragraph 3.3.2., the vehicle shall emit a sound: (a) … (b) That has at least two of the one-third octave bands according to Table 2… At least one of these bands shall be below or within the the1,600 Hz one-third octave band…" By using one or more of the lower 1/3 octave bands at the lower frequency range, the definition in UN R138 better considers the effects of age-related hearing loss and has the added effect of increasing the perceptibility of these warning sounds to pedestrians. Revise the relative volume requirement in S5.4 to only include bands with signal energy contributing to safety performance. Change the sameness requirements in S5.5 to permit integrated or multifunction sound systems, provided minimum detectability performance requirements are met. Revise the standard to allow vehicles to produce alternative compliant sounds in reverse through adjustments to the sameness requirement. NHTSA should also codify optional compliance requirements related to the user-activated horn interpretation[20] into FMVSS No. 141. Codifying requirements for a user-activated horn to optionally utilize the same speakers as the pedestrian alert system would allow sufficient public input on the requirements for this function, increase regulatory certainty for manufacturers, and ensure the intended safety benefits of the pedestrian alert system.

[18] https://www.iso.org/standard/80707.html

[19] https://www.sae.org/standards/content/j2889/1_201511/

[20] https://www.nhtsa.gov/interpretations/571141-ncc-230601-001-nagaraj-superhorn

FMVSS No. 201; Occupant protection in interior impact	
Vestigial Classification	1, 2, 3, 4
Vestigial Determination	Sections S6-S10 of FMVSS No. 201 were issued prior to the ubiquity of side curtain and seat-mounted airbags in the fleet and the high seat belt use rates achieved in the U.S., making the energy-absorbing requirements redundant and potentially ineffective. Designing interior structures to the specifications of FMVSS No. 201 limits engineering ingenuity and creates a compliance burden with little to no safety benefits, since vehicles meet or exceed the FMVSS No. 201 head acceleration performance criteria with modern head side airbags. FMVSS No. 201 may be unnecessarily constraining the design of more effective mitigations like side airbags, and in particular, side curtain airbags. These requirements are also unique to the U.S., which creates additional cost and design burdens. The ubiquity of control panel airbags (driver and passenger frontal airbags) in the fleet reduces the necessity of energy-absorbing requirements for control panel materials in S5.1, making them redundant. UN R21 prescribes alternative requirements for head impacts to be performed on the control panel, calculating actual head impact zone and considering restraint system effect (i.e. safety belts and airbags), limiting head impact test areas to the experimentally calculated ones. Harmonizing these requirements could reduce compliance burden without compromising the safety of occupants. UN R21 Annex 8 further allows omission of certain interior head impact tests when the manufacturer demonstrates that the installed restraint system prevents occupant head contact with the interior. This approach recognizes the protective effect of modern restraint systems and provides a more flexible compliance pathway than the prescriptive material requirements in FMVSS No. 201. The need for compartments to remain latched at discrete accelerations (30g or 10g) in S5.3 does not consider the true world condition where there are cyclic or higher accelerations seen in standard collision requirements (such as FMVSS Nos. 208 and 214). Additionally, the method of using calculations makes this further removed from true world performance. The requirement in S5.5 for armrest coverage within the pelvic impact zone does not – on its own - ensure proper energy absorption in a side impact. Again, most vehicles are equipped with side curtain and seat-mounted airbags which prevent direct loading of outboard armrests. For the center console, armrest geometry constraints do not enable more useful console designs (sliding armrests or moving consoles) and the force/deflection test alternative is unnecessary as there are no "rigid" components in a free-standing floor console. FMVSS No. 201 requires the installation of sun visors made from energy-absorbing materials for both driver and passenger seats. This requirement imposes significant constraints on vehicle architecture, indirectly mandating specific characteristics for the roof and windshield structures, causing an indirect ban on vehicles with specific and innovative architectures. Furthermore, it lacks technological neutrality, as alternative solutions (e.g. such as shaded bands in the upper area of the windshield)

	have been available on the market for a considerable time. In addition, sun visor radius requirements are arbitrarily assigned to an area of minimal contact by the occupant. This requirement is not applied to other high contact surfaces (IP or seats per S 5.1 and S5.2) within the interior. Further, the energy dissipation is proven by S6.
Recommended Regulatory Action	Initiate a review of applicable interior head impact requirements (S6-S10) to assess their continued alignment with modern vehicle restraint system architectures, including the widespread deployment of frontal, side curtain and seat-mounted airbags. Permit alternative compliance pathways that evaluate head injury performance in conjunction with advanced restraint systems, and consider harmonization with UN R21 approaches that define impact zones based on actual occupant kinematics and allow alternative compliance pathways where restraint systems prevent occupant head contact with interior structures. Revise S5.1 to allow performance-based alternatives that evaluate head impact risk considering restraint system effectiveness (e.g., seat belts and airbags), and consider harmonization with UN R21 methodologies that calculate actual head impact zones rather than prescribing broad material requirements. Reevaluate discrete acceleration-based latching requirements in S5.3 to ensure alignment with real-world crash characteristics reflected in FMVSS Nos. 208 and 214. If revised or repealed, compliance should be demonstrated through the existing occupant injury requirements of FMVSS Nos. 208 and 214, rather than new latching provisions. Review armrest coverage and pelvic impact provisions in S5.5 to ensure compatibility with modern side airbag protection strategies and evolving interior console designs. Permit alternative compliance methods where vehicle-level side impact performance objectives are satisfied. Reassess the prescriptive requirements for energy-absorbing sun visors to determine whether performance-based head injury criteria or alternative protective solutions can achieve equivalent occupant protection while preserving design flexibility and technology neutrality.

FMVSS No. 202a; Head restraints	
Vestigial Classification	3
Vestigial Determination	In comments [21] to the agency's July 16, 2024 ANPRM[22] to update FMVSS No. 207, Auto Innovators communicated its support for the agency's approach to updating both FMVSS Nos. 202a and 207. Since FMVSS No. 202a was first established, manufacturers have continued to advance seat and head restraint design, with modern seating systems increasingly developed and evaluated as integrated systems for rear-impact protection.
Recommended Regulatory Action	As suggested in Auto Innovators comments[23] filed on July 16, 2024, complete the necessary research prior to issuing an NPRM.

FMVSS No. 203; Impact protection for the driver from the steering control system	
Vestigial Classification	3
Vestigial Determination	The body block test in S5.1(a) is obsolete and redundant given modern vehicle architecture and restraints. Because of collapsible steering wheel columns, the load on the occupant chest is substantially reduced, even if the frontal airbag does not deploy. The test is only required for vehicles between 8,500 and 10,000 lb. and if the vehicle is not certified to FMVSS No. 208 S5.1, which is a superior assessment of safety. The jewelry test in S5.2 is also obsolete. Modern technology and designs, which have resulted in lower profile, smoother steering wheel and driver airbag cover surfaces, have evolved to reduce the need for this assessment without compromising safety.
Recommended Regulatory Action	Repeal the body block test in S5.1(a) and the jewelry test in S5.2.

[21] https://www.regulations.gov/comment/NHTSA-2024-0001-0018
[22] https://www.federalregister.gov/documents/2024/07/16/2024-15390/federal-motor-vehicle-safety-standards-seating-systems
[23] https://www.regulations.gov/comment/NHTSA-2024-0001-0018

FMVSS No. 204; Steering control rearward displacement	
Vestigial Classification	3
Vestigial Determination	See previous Auto Innovators comments.[24]
Recommended Regulatory Action	Promulgate a final rule aligned with the May 30, 2025, NPRM.[25]

FMVSS No. 205; Glazing materials	
Vestigial Classification	1, 2, 3, 4
Vestigial Determination	FMVSS No. 205 currently references a 1996 version of SAE Z26.1, which does not reflect more recent updates to glazing test procedures and classifications. The SAE glazing committee is finalizing a major update to SAE Z26.1, which is expected to replace the currently referenced ANSI/SAE Z26.1-1996 standard in FMVSS No. 205. Publication is anticipated in 2026.
Recommended Regulatory Action	When the SAE Z26.1 standard is updated, amend S5 to reference that version rather than the current ANSI/SAE Z26.1-1996 standard, including the differences identified in Table 1 (tests defined according to items 1-4), such as changes to the total number of tests and ball drop height requirements.

FMVSS No. 206; Door locks and door retention components	
Vestigial Classification	1, 2, 3, 4
Vestigial Determination	If door opening prevention is incorporated into frontal/rear crash standards, portions of FMVSS No. 206 would become duplicative, allowing for a reduction in burdensome regulatory testing. Reliance on stand-alone interpretation letters, such as for double-locking anti-theft designs, creates fragmented and unclear compliance expectations. Certain provisions in S4.1, S4.3.1, and S4.3.2 assume mechanical handles and "separate actions" that do not align with modern electronic locking logic, proximity authentication, or AV-oriented interiors that may provide equivalent safety.

[24] https://www.regulations.gov/comment/NHTSA-2025-0032-0002

[25] https://www.federalregister.gov/documents/2025/05/30/2025-09738/federal-motor-vehicle-safety-standard-no-204-steering-control-rearward-displacement

	The 30g inertial load assumptions in S4.1.1.4, S4.2.1.3, and S5.1.1.4 assume mechanical actuation and underrepresents electronic latch logic and software-based strategies. Axis-specific static hinge tests in S4.1.2.1–S4.1.2.2, and S5.1.2 reflect historical designs and may duplicate validation already demonstrated under dynamic crash standards. Fixed-direction static force tests for latches are overly prescriptive, reflect legacy mechanical latch designs, and may not correlate with modern mechatronic latch behavior or performance in crashes. FMVSS No. 206 prescribes a specific door locking concept and excludes functionally equivalent solutions such as child safety locks for compliance purposes, diverging from UN R11 and driving region-specific designs.
Recommended Regulatory Action	Evaluate the consolidation of door retention requirements within frontal and rear dynamic crash standards to reduce redundancy without compromising safety. Incorporate double-lock guidance directly into FMVSS No. 206 regulatory text.[26] Revise S4.1, S4.3.1, and S4.3.2 to technology-neutral functional requirements focused on unintended door opening prevention and occupant egress. Allow alternative compliance paths reflecting validated electronic and functional safety strategies in S4.1.1.4, S4.2.1.3, and S5.1.1.4. Permit S4.1.2.1–S4.1.2.2, and S5.1.2 equivalency through compliance with applicable dynamic crash standards or modern structural validation methods. Transition S5.1.1.1–S5.1.1.3 toward performance-based retention criteria or permit equivalent demonstrations for electronic and software-based latch systems. Similar to UN R11, recognize child safety locks as an acceptable compliance pathway where equivalent safety performance is maintained. This would reduce unnecessary regulatory burden, enable technology-neutral design, and eliminate the need for market-specific hardware variants without compromising real-world safety

[26] https://www.nhtsa.gov/interpretations/08-000497-16-jan-09-rewrite

FMVSS No. 207; Seating systems	
Vestigial Classification	2, 3
Vestigial Determination	In comments[27] to the agency's July 16, 2024, ANPRM[28] to update FMVSS No. 207, Auto Innovators communicated its support for the agency's planned update. Since FMVSS No. 207 was first established, manufacturers have made continued progress in advancing designs, with modern seating systems exceeding the level of performance required by the current standard.
Recommended Regulatory Action	As suggested in Auto Innovators comments[29] filed on July 16, 2024, complete the necessary research prior to issuing an NPRM.

FMVSS No. 208; Occupant crash protection (seat belt reminder systems)	
Vestigial Classification	1, 2
Vestigial Determination	NHTSA issued a final rule to require seat belt reminder systems in rear row seating positions.[30] However, several requirements are misaligned with established international regulations such as UN R16. The agency adopted a unique approach whereby several aspects of the rule are not economically practical and will require costly redesign. NHTSA has underestimated the engineering costs required to design and implement the necessary hardware and complex software changes required to meet the rule. Specifically, high seating capacity vehicles may necessitate additional technology and a robust Human-Machine Interface (HMI) to manage reminders for numerous occupants, thereby increasing complexity and cost. Auto Innovators anticipated the proposed requirements would result in significant consumer acceptance issues and filed a petition for reconsideration on the rule.[31] According to the Office of Information and Regulatory Affairs, NHTSA has submitted an interim final rule (IFR) responding to petitions for reconsideration related to seat belt warning systems.[32]
Recommended Regulatory Action	NHTSA should address the concerns raised in Auto Innovators' petition for reconsideration[33] regarding the expanded seat belt reminder system requirements in FMVSS No. 208 as part of the ongoing rulemaking actions.

[27] https://www.regulations.gov/comment/NHTSA-2024-0001-0018
[28] https://www.federalregister.gov/documents/2024/07/16/2024-15390/federal-motor-vehicle-safety-standards-seating-systems
[29] https://www.regulations.gov/comment/NHTSA-2024-0001-0018
[30] https://www.nhtsa.gov/sites/nhtsa.gov/files/2024-12/SBRS-Final-Rule-12162024-web-version.pdf
[31] https://www.regulations.gov/document/NHTSA-2024-0071-0006
[32] https://www.reginfo.gov/public/do/eoDetails?rrid=1299514
[33] https://www.regulations.gov/document/NHTSA-2024-0071-0006

	Specifically, the agency should: • Reduce regulatory burden associated with late-stage design changes by extending the lead time provided for complying with the updated front and rear seat belt reminder system requirements and including a phase in period, and • Clarify the requirements for visual warnings associated with multiple front outboard seats. Remedying these issues through the planned IFR[34] would help ensure the rule is practicable to implement while preserving the safety benefits associated with expanded seat belt reminder systems.

FMVSS No. 208; Occupant protection (repeal unbelted requirements or provide alternatives)	
Vestigial Classification	2
Vestigial Determination	Seat belt use rates are over 91% nationally, creating opportunities to deemphasize the regulatory requirements surrounding unbelted occupant protections. Because of these requirements, current airbags must accommodate occupants spanning a complex design range that accommodates large unbelted and small belted occupants. Repealing the unbelted requirements of FMVSS 208 would allow manufacturers and suppliers to allocate increased engineering resources to systems that improve outcomes for the majority of occupants who are belted.[35] Resources could be better allocated to improving protections for smaller female and child occupants. Unbelted testing requirements impose significant vehicle development costs and force automakers to allocate resources to scenarios (e.g. crash tests with unbelted dummies) that no longer reflect real-world safety needs and can result in tradeoffs when ensuring the safety of belted occupants in the real world. On July 2, 2020, Auto Innovators submitted a petition[36] to NHTSA to modify aspects of FMVSS No. 208 ("Occupant crash protection") to add a compliance option for vehicles equipped with Seat Belt Assurance System (SBAS) technology to be exempt from the current unbelted test requirements. Providing this additional compliance option will enable interior and restraint system designs that can further reduce injuries for properly restrained front seat occupants and help address regulatory burden associated with the unbelted test. Given that the fitment of the SBAS systems will be voluntary, it also provides an opportunity to introduce the systems in a gradual manner.

[34] https://www.reginfo.gov/public/do/eoDetails?rrid=1299514

[35] https://www.nhtsa.gov/vehicle-safety/seat-belts

[36] https://www.autosinnovate.org/posts/letters/Auto%20Innovators%20FMVSS%20208%20Seat%20Belt%20Petition%20for%20Rulemaking%20July%202%2020%20%28ID%202516%29.pdf

Recommended Regulatory Action	Repeal costly unbelted testing requirements to allow allocation of engineering resources to improving belted occupant restraint outcomes or provide a compliance option alternative that supports regulatory flexibility and the introduction of innovative safety technology. Related out of position testing requirements should also be repealed.

FMVSS No. 208; Occupant protection (modernize and clarify)	
Vestigial Classification	3
Vestigial Determination	FMVSS No. 208 includes several unclear requirements that require extensive, costly, and time-consuming agency interpretations. A streamlined and simplified standard that more cleanly conveys the restraint requirements for modern vehicles would remove regulatory inefficiencies surrounding these legal interpretations and enable OEMs to deploy innovative product designs with increased certainty. The content of the non-permanent label on the dashboard required by S4.5.1 overlaps substantially with the content of the permanent label on the sun visor, increasing costs for no added safety benefit. S4.1.5.5.2 prescribes specific design features for seat belt release mechanisms associated with folding seats (e.g., "key or key-like object"), reflecting legacy mechanical seat architectures. These design-specific constructs limit flexibility for modern seat belt systems and alternative release strategies that can provide equivalent occupant protection. This requirement does not account for contemporary integrated restraint systems, electronic release mechanisms, or alternative engineering solutions capable of maintaining belt integrity and proper reattachment performance. The chest contact force measurement in S7.4.3 reflects legacy instrumentation and may also introduce variability relative to modern thoracic injury metrics.
Recommended Regulatory Action	Undertake a structured modernization of FMVSS No. 208 to remove and/or consolidate outdated provisions, harmonize duplicative requirements, and update terminology and performance language to reflect current restraint technologies and injury assessment methodologies while preserving occupant protection performance objectives. Reduce cost and compliance burden by reorganizing and clarifying the regulation as well as incorporating extensive legal interpretations. Repeal S4.5.1(e) as the content of the non-permanent label on the dashboard overlaps substantially with the required content of the permanent label on the sun visor. Provide additional design flexibility in S4.1.5.5.2 to allow for new seat belt release mechanisms. More specifically, the standard should be revised to no longer specific design-restrictive criterion such as "key or key-like object" if a manufacturer can provide similar levels of protection through other means. Modernize S7.4.3 to improve objectivity and repeatability while maintaining equivalent thoracic injury protection.

FMVSS No. 209; Seat belt assemblies	
Vestigial Classification	1, 3
Vestigial Determination	There are several outstanding petitions for rulemaking to modernize the requirements of FMVSS No. 209 such as through aligning with UN R16. Current rules limit the fitment of seat belt pretensioners and load limiters in rear row seating positions. Favorable resolution of these petitions will help support innovative restraint system designs, improve safety, and to be responsive to recent changes to the IIHS test procedures for evaluating rear row occupant protection in frontal impacts. Many OEMs have filed petitions for inconsequential noncompliance related to S4.1(k) requiring instruction sheets for seat belt assemblies.[37,38] Due to their complexity and to align with safety best practices, dealerships and authorized repairs shops typically perform these installations and have the necessary instructions. The belt buckle push test specified in S4.3(d)(3) reflects legacy seat belt configurations, particularly Type I lap belt systems where the buckle was integrated into the belt webbing. Modern passenger vehicles overwhelmingly use Type II lap-shoulder belt systems with buckles mounted to the seat structure or rigid stalks, making the historical buckle-in-webbing configuration largely obsolete. As a result, this test addresses belt architectures that are no longer representative of current vehicle designs.
Recommended Regulatory Action	Reduce regulatory burden and modernize outdated requirements through alignment with international standards by including a new compliance option to permit the use of seat belt pretensioners and load limiters in rear row seating positions. Remove S4.1(k) or update this section of the regulation to allow for a digital instruction sheet. Review legacy test provisions such as the belt buckle push test in S4.3(d)(3) to determine whether they remain applicable to modern belt system architectures.

[37] https://www.federalregister.gov/documents/2007/12/18/E7-24443/bentley-motors-inc-grant-of-petition-for-decision-of-inconsequential-noncompliance

[38] https://www.federalregister.gov/documents/2009/03/02/E9-4275/hyundai-motor-company-grant-of-petition-for-decision-of-inconsequential-noncompliance

FMVSS No. 210; Seat belt assembly anchorages	
Vestigial Classification	2, 4
Vestigial Determination	Certain provisions of FMVSS No. 210 reflect legacy design assumptions and test methodologies that diverge from modern restraint system architectures and international standards. In particular, the Force Application Device (FAD) method used to evaluate certain belt anchorage load paths requires specialized test hardware and vehicle modifications that are not representative of current vehicle designs and can impose unnecessary testing burden without a demonstrated incremental safety benefit. The FAD test procedure reflects legacy restraint architectures in which belt loads were reacted primarily through body-mounted anchorages. Modern vehicles can employ seat-integrated restraint systems in which the belt load path is carried through the seat structure. In these designs, the FAD method may require non-representative test configurations and additional fixtures that do not reflect real-world restraint load paths. Current FMVSS No. 210 provisions were developed primarily around fixed forward-facing seating configurations and may not fully accommodate emerging vehicle interior concepts while maintaining equivalent occupant protection performance. The regulation relies on prescriptive "fields of application" describing allowable belt routing and anchorage positioning, which were developed for earlier seat architectures. These provisions can restrict design flexibility for modern seating systems, including reclining, rotating, or alternative seating configurations, and may limit the integration of emerging restraint technologies. These requirements differ from the more performance-oriented approaches used in UN R14, creating unnecessary divergence between regulatory frameworks and increasing global design and validation complexity.
Recommended Regulatory Action	Revise FMVSS No. 210 to better align with modern restraint system designs and international regulatory approaches by: • Harmonizing key provisions with UN R14, including anchorage evaluation methodologies where appropriate. • Reevaluating or replacing the Force Application Device (FAD) test provisions with updated performance-based assessment methods that reflect contemporary vehicle architectures. • Modernizing the prescriptive "fields of application" requirements to permit greater flexibility in belt anchorage positioning while maintaining equivalent safety performance. These updates would reduce unnecessary design constraints and testing burden while preserving the safety objectives of the standard.

FMVSS No. 214; Side impact protection	
Vestigial Classification	1, 2, 3, 4
Vestigial Determination	S6 requires a static door crush test that was developed for earlier vehicle architectures and may not correlate with dynamic crash performance in MDB or pole tests. Modern vehicle designs incorporate multi-material structures, managed load paths, advanced restraints, and energy-absorbing door systems that are evaluated more directly through dynamic side-impact requirements. Under the static door crush test requirements, the impactor position and corresponding travel requirements can result in unintended battery crush in EVs with overlapping door designs that may not reflect real world crash conditions. Given the expansion of regulated and third-party dynamic crash test modes (e.g., MDB, pole, NCAP, IIHS), the static door crush requirement may be redundant and may not reflect real-world crash injury mechanisms.
Recommended Regulatory Action	Modernize S6 by allowing compliance via demonstrated performance in dynamic side-impact tests (e.g., MDB or pole) as an alternative to the static door crush test. This retains the underlying side-impact protection objective while reducing redundancy and improving alignment with current vehicle structures, real-world crash conditions, and performance-based evaluation methods. If the static door crush test is maintained, revise the procedure to better align with modern EV architectures, ensuring the test intent is maintained without introducing unintended battery loading conditions.

FMVSS No. 219; Windshield zone intrusion	
Vestigial Classification	3
Vestigial Determination	On July 7, 2008, NHTSA issued a regulatory proposal[39] to repeal FMVSS 219. The agency stated in its proposal that "NHTSA tentatively concludes that the windshield zone intrusion standard is no longer necessary because other FMVSSs are now in place to meet the safety need that the standard had addressed." Per that proposal, the dummy performance requirements of FMVSS 208 are expected to "reflect any blunt impact injuries due to zone intrusions at the windshield" and "the air bag will aid in preventing any lacerative injuries."
Recommended Regulatory Action	Reduce compliance and testing costs and remove unnecessary requirements by repealing the rule.

[39] https://www.regulations.gov/document/NHTSA-2008-0124-0001

FMVSS No. 225; Child restraint anchorage systems	
Vestigial Classification	2
Vestigial Determination	Changes to top tether (via routing under/over the head restraint) were shown not to impact child restrain kinematics,[40] yet NHTSA forces costly changes to manufactures without proven safety benefit. The final rule mentions that routing over a head restraint improves access to the hardware. The final rule requires adjustable head restraints to comply with the minimum distance of a tether anchorage from R-Point but does not have similar requirements for vehicle seats with fixed head restraints. In addition, most of the requirements in FMVSS No. 225 are similar to UN R145, except for the addition of the top tether in U.S. vehicles. However, the number of tests required depends on the vehicle, which can vary substantially between the U.S. and international approaches, with the U.S. requirements having a higher burden.
Recommended Regulatory Action	Revise requirements for top tethers that have no added safety benefit. Consider ways to reduce the testing volume in FMVSS No. 225 to better align with UN R145 without compromising safety.

FMVSS No. 226; Ejection mitigation	
Vestigial Classification	4
Vestigial Determination	S4.2.4 contains requirements that are administrative or procedural in nature rather than objective, measurable performance criteria. As drafted, this provision may not align fully with the Safety Act's emphasis on objective, performance-based standards.
Recommended Regulatory Action	Relocate S4.2.4 to an appropriate regulatory part outside the FMVSS performance standard (e.g., a procedural or certification-related part), while retaining the core ejection mitigation performance requirements within FMVSS 226.

[40] https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/effect-tether-routing-anchor-location-child-restraint-kinematics-812467.pdf

FMVSS No. 228; Pedestrian head protection	
Vestigial Classification	3
Vestigial Determination	In September 2024, NHTSA issued a notice of proposed rulemaking to establish a new FMVSS for pedestrian head impact protection. As noted in Auto Innovators response[41] to the agency, there are several fundamental issues with the proposal which stem from the agency's deviation from the GTR. Fundamentally, the NPRM substantially underestimates the extent of the design changes, lead time, and research and development costs needed to meet the proposed requirements, and would prohibit many vehicles such as work trucks and SUVs from being sold in the United States.
Recommended Regulatory Action	Reduce regulatory burden through alignment with international standards. Amend rulemaking proposal to align with comparable requirements in other markets (e.g., UN R127, India AIS 100, Brazil CONTRAN Res. No. 752).

FMVSS No. 302; Flammability of interior materials	
Vestigial Classification	1
Vestigial Determination	FMVSS No. 302 was largely designed around fire risks from ignition sources like matches and cigarettes. This risk assessment may be outdated due to decreases in smoking rates. The standard relies on a prescriptive list of regulated interior components and terminology that does not consistently align with modern vehicle designs and materials (e.g., curtains/shades, wheel housing covers, engine compartment covers, mattress/cargo covers). It also contains requirements for "any other interior materials" that create ambiguity in applicability and inconsistent compliance expectations. In addition, the standard does not include practical applicability thresholds (e.g., based on component size or geometry), which can require testing of very small or low-exposure parts that are unlikely to influence occupant fire risk, increasing compliance burden without a corresponding safety benefit. The current test framework also lacks practical provisions for representative component grouping and applicability thresholds. Similar interior components that differ only in color, orientation, or minor geometry may require redundant testing, and very small components with minimal exposure within the occupant compartment may still fall within the scope of the standard. In addition, rigid environmental conditioning requirements can create practical challenges for small laboratory chambers without affecting the underlying flammability performance of the material.

[41] https://www.regulations.gov/comment/NHTSA-2024-0057-5841

	The standard also reflects a legacy flammability test construct based on small horizontal specimens, which may not always be representative of modern material assemblies or installed orientations in the vehicle interior.
Recommended Regulatory Action	Modernize and clarify the regulated component list and definitions in FMVSS No. 302 to reflect current vehicle architecture, modern materials (including as composite structures), and interior content, including updated terminology and examples for newer interior components. Add an applicability screen based on component size, geometry, and occupant exposure, such that components below defined dimensional thresholds (or otherwise not relevant to occupant compartment exposure) are excluded from testing, consistent with an established technical rationale such as GB 8410 or UN R118. Consider allowing more representative test articles or orientations, where appropriate, for modern material assemblies, while avoiding unnecessary expansion of test burdens or the creation of prescriptive new design requirements. The following areas should also be considered for revision: • Sample prep: For molded parts, testing can be done on 2 mm thick sheet material, or the part can be cut to a 13 mm maximum thickness. • Small part exemption: Parts with a surface area smaller than 0.062 m^2 (approx. A4 size) or weighing less than 250 g do not require testing. • Material exemption: Metal and glass components are exempt from testing. • Pre-conditioning: Samples must be conditioned for 24 hours at 21°C (70°F and unspecified humidity before testing). Many institutes experience difficulty with the existing definition because the values fluctuate significantly after the start of the test due to the effects of heat in small test chambers. The agency may also want to consider allowing larger or alternative test chambers to enable testing of larger components. Allow representative component grouping where similar parts differ only by cosmetic or minor geometric features, and review environmental conditioning provisions to ensure they remain practical and representative of modern testing environments.

FMVSS No. 303; Fuel system integrity of compressed natural gas vehicles.	
Vestigial Classification	2
Vestigial Determination	FMVSS No. 303 includes impact test modes and procedures (including side and rear impact conditions) that differ from other propulsion system integrity regulations (e.g., FMVSS Nos. 301, 305/305a, and 307). This non-harmonized structure can require duplicative or non-aligned test configurations for vehicles with multiple propulsion systems (e.g., bi-fuel or dual-fuel architectures), increasing compliance burden without a clear corresponding safety benefit.
Recommended Regulatory Action	Align FMVSS No. 303 impact test modes with FMVSS Nos. 301, 305/305a, and 307 (and related propulsion integrity standards as appropriate) and permit equivalent compliance demonstrations for multi-fuel vehicles based on harmonized test outcomes.

FMVSS No. 305a; Electric-powered vehicles	
Vestigial Classification	3
Vestigial Determination	On December 20, 2024, NHTSA finalized FMVSS No. 305a,[42] which replaces FMVSS No. 305, "Electric-powered vehicles: Electrolyte spillage and electrical shock protection." Among other changes, FMVSS No. 305a would apply to light and heavy vehicles and would have performance and risk mitigation requirements for the propulsion battery. Auto Innovators supports NHTSA efforts to establish FMVSS No. 305a. However, per our NPRM comments[43], we have outstanding concerns regarding the extent to which the agency proposal deviates from the established Global Technical Regulation (GTR No. 20) on Electric Vehicle Safety's allowance of component-level testing as an option for certification purposes. The incongruence of NHTSA requiring a vehicle-only certification approach adds unnecessary cost burdens and testing complexities for OEMs and, ultimately, provides consumers with de minimis, if any, added safety benefits. The S13 continuous audible warning and fixed activation timing provisions reflect earlier monitoring assumptions and may not align with modern battery management systems, advanced diagnostics, or automated driving vehicle architectures. The prescriptive trigger structure for single-cell thermal events does not differentiate between localized, contained events and propagating hazards, and may not reflect advancements in REESS containment and isolation strategies. FMVSS No. 305 does not clearly define performance and verification requirements for 48V systems and excludes them from high-voltage shutdown verification, which may create a potential safety gap in post-crash scenarios as these vehicle

[42] https://www.federalregister.gov/documents/2024/12/20/2024-28707/federal-motor-vehicle-safety-standards-fmvss-no-305a-electric-powered-vehicles-electric-powertrain
[43] https://www.regulations.gov/comment/NHTSA-2024-0012-0027

	architectures become more prevalent in modern vehicles. Without affecting requirements for the 60VDC/30 VAC vehicles currently in scope, the standard should introduce physical protection requirements that accommodate 48V mild hybrid vehicles given the agency's NPRM acknowledgement their design strategies ensure a low likelihood of electric shock.
Recommended Regulatory Action	Align FMVSS No. 305a with GTR No. 20 to explicitly allow component-level tests, and amend the S13 5-minute continuous audible warning requirement in the case of thermal events. The S13 requirements surrounding the thermal event warning for even a single cell of a cylindrical cell-based REESS should be revised, such as "S13. *Warning in the case of thermal event in REESS that could be hazardous to vehicle occupants*. The vehicle shall provide a warning to the driver in the case of a thermal event in the REESS that could be hazardous to vehicle occupants when the vehicle is in active driving possible mode. The thermal event warning system must monitor its own readiness. The warning shall activate within three minutes of the onset of the thermal event. The warning shall consist of auditory or visual signals that remain active for at least 5 minutes. For a vehicle with automated driving systems and without manually operated driving controls, the visual warning must be provided to all the front row occupants." Revise FMVSS No. 305a to explicitly exempt MHEV vehicles from having to use electrical isolation safety measures that would involve more complexity, higher consumer costs, and higher mass, without an incremental safety benefit.[44] Clarifying these requirements would reduce potential ambiguity in the standard while further enhancing occupant and first-responder safety.

[44] https://www.federalregister.gov/documents/2017/09/27/2017-20350/federal-motor-vehicle-safety-standards-electric-powered-vehicles-electrolyte-spillage-and-electrical#p-144

FMVSS Nos. 307 & 308; Fuel system integrity of hydrogen vehicles & Compressed hydrogen storage system integrity	
Vestigial Classification	3
Vestigial Determination	NHTSA finalized a rule to establish two new FMVSS specifying performance requirements for all motor vehicles that use hydrogen as a fuel source.[45] Auto Innovators supports NHTSA efforts to establish FMVSS for both fuel system and storage system integrity. However, we have concerns regarding the extent to which the agency proposal deviates from certain aspects of the established Global Technical Regulation (GTR No. 13) on Hydrogen and Fuel Cell Vehicles.[46] While we generally support the areas of the final rule where the agency has aligned its proposal with the GTR, areas of misalignment around labeling requirements, in-cabin hydrogen detector requirements, and deviations from certain GTR testing requirements such as the failure to include the vehicle's protective shield from the compressed hydrogen storage system (CHSS) fire exposure test may create compliance testing inconsistencies. These create regulatory uncertainty and increase the cumulative burden due to the need to certify and/or modify vehicles to meet US-specific design and testing requirements. This incongruence adds unnecessary cost for OEMs and, ultimately, provides consumers with de minimis, if any, added safety benefits.
Recommended Regulatory Action	Reduce regulatory burden through alignment with international standards by revising labeling, in-cabin hydrogen detector, and other testing requirements and including the vehicle's protective shield in the CHSS fire exposure test. Many of the requirements not aligned with GTR No. 13 are mentioned in Toyota petitions and supplemental information submitted on March 3, 2025[47] and December 19, 2025.[48]

[45] https://www.federalregister.gov/documents/2025/01/17/2024-31367/federal-motor-vehicle-safety-standards-fuel-system-integrity-of-hydrogen-vehicles-compressed
[46] https://www.regulations.gov/comment/NHTSA-2024-0006-0025
[47] https://www.regulations.gov/document/NHTSA-2024-0090-0004
[48] https://www.regulations.gov/document/NHTSA-2024-0090-0005

FMVSS No. 401; Interior trunk release	
Vestigial Classification	1, 2, 3, 4
Vestigial Determination	The definition of "trunk compartment" in S3 reflects legacy vehicle architectures with fixed partitions and conventional sedan layouts. Modern vehicle designs — including hatchbacks, crossovers, modular cargo areas, and BEVs without traditional trunks — do not consistently align with these definitions, creating ambiguity in applicability. The requirement in S4 for a manual or automatic interior trunk release presumes traditional mechanical latch-based trunk systems and mandates either a manual or automatically triggered physical release. Modern vehicles increasingly utilize electronic latching, proximity unlock, internal occupant detection sensors, or software-controlled access systems that may provide equivalent or superior entrapment mitigation without relying on conventional mechanical release mechanisms. The requirement in S4.2(a) for a glowing or illuminated manual lever assumes a physical mechanical release handle. Modern interfaces may use electronic controls, integrated panels, or digital interfaces that do not rely on phosphorescent hardware and may provide alternative detection and release mechanisms. The fixed 5-minute automatic release timing requirement in S4.2(b) presumes a simple automatic unlatching mechanism and may not align with modern occupant detection technologies, environmental sensors, or software-based logic that dynamically evaluates entrapment conditions. A static timing trigger may not reflect contemporary system capabilities. The prescriptive mechanical latch behavior requirements in S4.3 reflect conventional mechanical trunk systems and do not fully account for electronic latches, soft-close systems, or electronically controlled closures integrated with ADAS or AVs.
Recommended Regulatory Action	Update the definition of "trunk compartment" in S3 to reflect contemporary vehicle architectures, including modular cargo areas and enclosed rear storage spaces, using performance-based or functional criteria rather than fixed structural assumptions. Revise S4 to permit technology-neutral entrapment mitigation solutions, including electronic or sensor-based systems, provided they demonstrate equivalent occupant egress capability. Permit alternative visibility and identification methods for trunk release systems under 4,2(a), including electronic, illuminated, or digital indicators, where equivalent occupant recognition and usability can be demonstrated. Allow alternative automatic release strategies under 4.2(b) based on occupant detection or environmental sensing, provided they ensure timely and reliable occupant egress under foreseeable entrapment conditions.

	Update S4.3 to focus on performance-based egress outcomes rather than prescriptive latch configurations, ensuring compatibility with electronically controlled trunk systems and modern vehicle architectures.

FMVSS No. 500; Low-speed vehicles	
Vestigial Classification	3
Vestigial Determination	FMVSS No. 500 limits low-speed vehicles (LSVs) to a maximum speed of 25 mph and prescribes limited equipment requirements reflecting their operational environment. Applying additional requirements such as FMVSS No. 111 rear visibility camera systems or FMVSS No. 141 pedestrian warning sound systems may not align with the intended operating domain, speed profile, or risk exposure of LSVs.
Recommended Regulatory Action	Clarify that certain higher-speed or higher-risk equipment requirements (e.g., rear visibility camera systems and pedestrian warning sound requirements) are not applicable to vehicles governed exclusively by FMVSS No. 500, unless risk-based analysis supports such application. This would maintain alignment between operating domains and safety equipment requirements.

Parts 541 and 543; Federal motor vehicle theft prevention standards and exemptions	
Vestigial Classification	4
Vestigial Determination	The existing Parts 541 and 543 allow only one car line per model year to receive an exemption from anti-theft label placement requirements if equipped with immobilizers. Expanding these exemptions would streamline compliance for U.S exported and domestically or in U.S. produced vehicles, addressing both safety and anti-theft priorities without compromising regulatory intent. Ideally, NHTSA would exclude vehicles which are equipped with an immobilizer from the scope of Part 541, so that these vehicles will be automatically exempt from parts marking requirements, and avoiding the need for the Part 543 petition for exemption process. A statutory amendment may be required, per Global's comments[49] to the 2017 regulatory review, but DOT should seek to support legislation that would allow these changes. Generally, reducing the number of required parts marking locations in Part 541.5(a) could help reduce manufacturing costs and increase efficiency without materially affecting theft prevention or vehicle safety. Confirmation of vehicle theft becomes less reliable as vehicles age, and the long-term benefits of extensive VIN stamping on the 18 components described for parts marking are not proven to provide increased theft prevention utility – but instead add significant upfront costs. While using VINs is an established method for parts marking, other forms of unique identification, such as QR codes, could also be considered an optional method of regulatory compliance. QR code technology allows additional information to be stored and accessed efficiently and succinctly. Coupled with an edit to Part 541.5(a), the number of VIN marking locations could be reduced while increasing the amount of accessible identification information in areas where marking remains required.
Recommended Regulatory Action	Reduce parts-marking costs and incentivize installation of more technologically effective immobilizers by expanding parts marking exemptions for multiple vehicle lines per model year if immobilizers are standard. Consider reducing or eliminating the number of required VIN-marked parts under Part 541.5(a). If elimination of parts marking requirements is not possible, allow alternative identification techniques, such as QR codes, as an optional method of compliance.

[49] https://www.regulations.gov/comment/DOT-OST-2017-0069-2772

Part 563; Event data recorders	
Vestigial Classification	3
Vestigial Determination	On December 18, 2024, NHTSA issued a final rule on changes to the Part 563 event data recorder (EDR) requirements.[50] The final rule did not address industry concerns that the rule will significantly increase both the EDR size (requiring repackaging) and cost to consumers, with questionable and unquantified safety benefits. Auto Innovators submitted a petition for reconsideration to this rule.[51] NHTSA published the response to petition for reconsideration as an NPRM on November 28, 2025,[52] which accepted aspects of the Auto Innovators petition (three years of lead time and a four-year phase-in (25/50/75/100 percent). The deadline for comments on the NPRM was December 29, 2025.
Recommended Regulatory Action	Promulgate a final rule aligned with the November 28, 2025, NPRM.

[50] https://www.federalregister.gov/documents/2024/12/18/2024-29862/event-data-recorders
[51] https://www.regulations.gov/document/NHTSA-2024-0084-0005
[52] https://www.federalregister.gov/documents/2025/11/28/2025-21506/event-data-recorders

Part 572; Anthropomorphic test devices	
Vestigial Classification	3
Vestigial Determination	Anthropomorphic test device (ATD, or dummy) development has and continues to be inordinately costly. The costs associated with ensuring compliance to a standard requiring the use of a new device are also enormous and are completely disproportional to safety benefits. For example, NHTSA has focused on demonstrating the biofidelity of the THOR dummy without showing how it will significantly improve frontal crash protection. The cost of a THOR dummy is an order of magnitude higher than that of the currently used test devices. These increased costs will be difficult to absorb for major OEMs and nearly impossible for smaller OEMs. Independent test laboratories will have to greatly increase testing costs because of THOR's added data collection capabilities and other complexities, such as recalibration and requalification procedures. Rather than advance increasingly outdated technology like crash test dummies, DOT should instead focus its research resources on improving more innovative and flexible technology like simulation tools. Certain subparts (B, C, D, F) specify anthropomorphic test devices that are no longer referenced in active FMVSS compliance requirements. Maintaining obsolete dummy specifications within Part 572 may create confusion and administrative complexity without corresponding regulatory application.
Recommended Regulatory Action	Reduce the regulatory cost burden by incorporating any new anthropomorphic test devices to Part 572, in particular THOR 50th or THOR 5th, as options for compliance or consumer information program use and not as testing requirements. Remove or archive subparts corresponding to test devices no longer referenced in active FMVSS requirements, or clearly designate them as historical/retained-for-legacy-certification purposes only. Ensure that Part 572 reflects only currently utilized compliance test devices, while ensuring subparts for current test devices that reference older subparts (e.g., test equipment) contain all the necessary provisions.

Part 575; Consumer information	
Vestigial Classification	1
Vestigial Determination	The provisions in Part 575 requiring the inclusion of New Car Assessment Program (NCAP) safety ratings on the Monroney label illustrate how requirements can become vestigial over time. Congress directed NHTSA in SAFETEA-LU (15 U.S.C. §1232(g)) to include NCAP safety ratings on the Monroney label, and NHTSA implemented those requirements in 49 CFR 575.302 in 2011. At the time, the requirement served a meaningful consumer information purpose by increasing the visibility of crashworthiness ratings at the point of sale. However, embedding the content, format, and sequencing of NCAP information in regulation has unintentionally constrained the program's ability to evolve. Because the label elements are codified in regulation, even minor improvements to how NCAP information is presented require a full rulemaking. This rigidity has slowed NHTSA's ability to incorporate evaluations of modern crash avoidance technologies, despite the agency acknowledging as early as 2011 that the printed label format limits its ability to convey such information.[53] As a result, while NCAP has expanded to evaluate advanced driver assistance technologies, the Monroney label has remained largely unchanged and does not communicate these results to consumers at the point of sale. The regulatory structure creates administrative barriers to updating consumer information and limits the agency's ability to reflect current vehicle safety technologies. NHTSA has taken steps towards NCAP modernization through roadmap publications[54] and other consumer information initiatives directed by the IIJA.[55] However, the statutory and regulatory structure governing Monroney label disclosures continues to slow the agency's ability to implement program updates. While we appreciate the agency's consumer information qualitative testing plans,[56] those activities indicate that a final rule to update the label may still be years away. In contrast, other consumer information programs, such as the Insurance Institute for Highway Safety (IIHS), routinely update test criteria and implementation timelines. Accordingly, the requirements in Part 575 governing the inclusion and formatting of NCAP ratings on the Monroney label have become functionally vestigial, as they constrain the agency's ability to modernize the consumer information available at the point of sale. Part 575 also presumes paper-based or physically affixed consumer information disclosures and does not reflect the widespread availability of in-vehicle digital displays, QR-based access, and manufacturer-hosted electronic information

[53] https://www.federalregister.gov/documents/2011/07/29/2011-19049/new-car-assessment-program-ncap-safety-labeling
[54] https://www.regulations.gov/document/NHTSA-2024-0077-0001
[55] https://www.congress.gov/bill/117th-congress/house-bill/3684/text
[56] https://www.federalregister.gov/documents/2025/12/05/2025-22057/agency-information-collection-activities-submission-to-the-office-of-management-and-budget-for

	platforms. Requiring exclusively physical labeling may limit the clarity, accessibility, and updateability of consumer information without enhancing transparency.
Recommended Regulatory Action	Repeal or substantially revise the prescriptive NCAP-related provisions in Part 575 to allow the agency to update consumer safety information without requiring rulemaking. Revise Part 575 to expand the use of digital or electronic consumer information disclosures in lieu of paper-based ones. The updated regulation should allow the agency to satisfy consumer information requirements through digital disclosure methods, such as QR codes or web links to current ratings and results. These could be adapted to printed or electronic Monroney label formats. NHTSA could then administer NCAP criteria and consumer information updates through its typical notice and decision process rather than through regulatory amendments. Modernizing Part 575 in this manner would preserve the consumer information intent of the original Congressional directive while allowing NCAP to evolve alongside advancing vehicle technologies. NHTSA should also consider ways to receive required manufacturer disclosures under Part 575 electronically instead of in paper form.

Part 581; Bumper standard	
Vestigial Classification	1, 2, 3, 4
Vestigial Determination	On December 5, 2018, following the voluntary memorandum of understanding with NHTSA (during which the concern was identified), Auto Innovators' predecessor trade associations filed a petition[57] to harmonize the current bumper test requirements with UN R42. The current Part 581 requirements continue to prioritize vehicle damageability in low-speed collisions over requirements that could focus more directly on pedestrian impact protection. Alignment or increased harmonization with UN R42 will reduce regulatory burden and permit manufacturers to reduce the stiffness of bumper systems to help improve pedestrian safety. While the pendulum tests in Part 581 and UN R42 are quite similar, they differ in the test criteria for sensors. In UN R42, sensors may be damaged by the pendulum as long as the basic driving functions (driving/braking/steering) are still functional. In Part 581, sensors may not be damaged if they are series equipment. This creates a large barrier for innovative ADAS systems, which need sensors in the bumper area. Continuing to require Part 581 bumper designs hinders design advancements and prevents optimization of sensing and perception technologies, particularly for ADAS. The requirements of 581.5(c) often force sensors like cameras, sonar, and

57 https://www.autosinnovate.org/posts/letters/Joint%20Alliance%20Global%20MEMA%20Part%20581%20Petition%20Phased%20Approach%20Dec%205%2018.pdf

	radar to be mounted in locations suboptimal for their performance and functional accuracy. As technology improves, Part 581 requirements may also become unnecessary as a result of parking sensors and related automatic braking systems deployment; however, the current regulation is preventing the deployment of some safety-enhancing sensors and systems from being offered as standard equipment in certain vehicles.
Recommended Regulatory Action	Provide immediate relief to industry concerns by vacating or reversing the 2016 letter of interpretation[58] that asserted electronic sensors mounted in and around the bumper are subject to part 581's damageability requirements. Reduce regulatory burden by repealing the Part 581 requirements altogether, or through better alignment with international standards such as UN R42. If Part 581 cannot be repealed, NHTSA should maintain the current scope of vehicles required to meet the regulation while aligning the test requirements for sensors with UN R42. Alternatively, address regulatory conflicts with other FMVSS and consumer information program requirements.

Part 595; Make inoperative exemptions	
Vestigial Classification	4
Vestigial Determination	Part 595 does not fully reflect the current regulatory framework governing completed vehicle manufacturers, incomplete vehicle manufacturers, intermediate manufacturers, final-stage manufacturers, and vehicle alterers as defined in Part 567. These entities possess substantial technical expertise in modifying vehicles to accommodate people with disabilities and, in many cases, recertify vehicles to applicable FMVSS following modification. Limiting the list of recognized modifiers may not align with the broader manufacturer certification structure and could restrict access to qualified entities capable of ensuring compliant and safe modifications.
Recommended Regulatory Action	Update Part 595 to align with the Part 567 manufacturer and alterer framework by recognizing completed vehicle manufacturers, incomplete vehicle manufacturers, intermediate manufacturers, final-stage manufacturers, and vehicle alterers as eligible entities for performing and certifying disability-related vehicle modifications, subject to existing FMVSS compliance obligations.

[58] https://www.nhtsa.gov/interpretations/16-000385-49-cfr-part-581-response-alliance-global

FMVSS (Various); Permitting electronic owner's manuals as an alternative to printed manuals	
Vestigial Classification	4
Vestigial Determination	The vehicle owner's manual is an important tool for providing owners with relevant information related to the safety, performance, and maintenance of a motor vehicle. However, the agency has discretion in terms of the information that must be provided in "printed matter" to the first purchaser of the vehicle. We recommend that NHTSA consider the development of new compliance options to permit digital format owners' manuals in lieu of hard copy (printed) owners' manuals. The use of electronic means of storing and communicating vehicle owner's manual information can improve the quality, utility, and clarity of information, by providing features and functionality that allow consumers to access relevant information more easily. These technological solutions ensure robust alternatives are provided while not compromising consumer access to relevant and up-to-date vehicle information.
Recommended Regulatory Action	Reduce regulatory cost and environmental impact of producing current vehicle owner's manuals.by updating owner's manual requirements within all applicable FMVSS/regulations to permit the use of electronic owner's manuals as a compliance alternative to requiring printed manuals.

Appendix B:

FMVSS No. 108 Vestigial Provisions and Modernization Opportunities

Contents

Overview of Appendix B: FMVSS No. 108 Vestigial Provisions and Modernization Opportunities

Auto Innovators members have communicated strong support for NHTSA to promulgate updates to modernize FMVSS No. 108. Auto Innovators provided FMVSS No. 108-related responses to NHTSA's Advance notice of proposed rulemaking (ANPRM) seeking public comment on any Federal Motor Vehicle Safety Standards (FMVSS) that may be a candidate for replacement, repeal, or modification[1], as well as responses to DOT[2] and OMB[3] requests for information on deregulatory opportunities. We are encouraged by the agency's upcoming NPRM[4] to assess FMVSS No. 108 to facilitate new designs and emerging technologies to maintain and improve safety. Specifically, we look forward to the agency's review to update requirements and test procedures for, among others, replaceable light sources, dusk sensors, plastic optical materials, semiautomatic beam switching, headlamp mounting orientation, minimum lamp size requirements, and harmonization to international standards. The intent to modernize FMVSS No. 108 to accommodate ADS[5] is also a welcome action and highlights the agency's focus on supporting innovative transportation solutions.

The regulation FMVSS No. 108 and its related test procedures[6] were developed around lighting technology that is now outdated. In many sections, the standard does not accommodate rapidly modernizing automobile lighting sensors, technologies, and designs already offered elsewhere. Several of these lighting designs have been proven to increase roadway safety in other countries but would be considered non-compliant with the U.S. standard and therefore cannot be deployed here to provide additional safety benefits. Certain areas of the standard may also not be prescriptive enough, which can lead to variability in state vehicle equipment laws that are burdensome for manufacturers to monitor and comply with.

Importantly, the standard does not allow for the automatic operation of lighting systems in situations that could improve safety. The antiquated FMVSS reduces design flexibility, hampers consumer choice, increases costs, and eliminates the ability to sell American products to a competitive global automotive market. This is of particular concern when Automated Driving Systems (ADS) or Advanced Driver Assistance Systems (ADAS) are

[1] https://downloads.regulations.gov/NHTSA-2020-0109-0008/attachment_1.pdf
[2] https://www.regulations.gov/comment/DOT-OST-2025-0026-0798
[3] https://www.regulations.gov/comment/OMB-2025-0003-8102
[4] https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202504&RIN=2127-AL95
[5] https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202504&RIN=2127-AM70
[6] https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/tp-108-13_tag.pdf

enabled and the role of the human driver is unnecessary or being assisted by the vehicle system. Unfortunately, NHTSA's final rule to update FMVSS No. 108 to accommodate adaptive driving beam technology[7] and subsequent denial of Auto Innovators' (and other) petitions[8] has stalled the broad deployment of this innovative technology. It is a specific area of the standard the agency should revisit, particularly since the 2022 final rule[9] did not meet the intent of the Congressional mandate in the Infrastructure Investment and Jobs Act (IIJA)[10] that ADB provisions would meet the performance requirements specified in SAE International Standard J3069.[11]

When repealing, removing, modifying, modernizing, or harmonizing any areas of this standard, NHTSA should afford manufacturers appropriate lead times and phase-in periods. NHTSA should allow manufacturers maximum compliance flexibility and promulgate technology-neutral and performance-based requirements. As design specifications are determined to meet U.S. consumer needs in terms of safety and product preference, equipment should be allowed to meet either the previous FMVSS No. 108 or the eventual new requirements, especially since the standard covers replacement parts and equipment may require extensive and time-consuming redesigns.

This Appendix details our priority areas for modernization and recommends extensive opportunities for regulatory reform. It outlines specific areas where the repeal, modification, or addition of requirements to FMVSS No. 108 would better support the agency's central mission of roadway safety while also fostering innovation. During NHTSA's exploration of ways to modernize the standard, we urge the agency to fully and thoroughly consider the ways it can harmonize aspects of FMVSS No. 108 with international standards; in particular, several UN regulations as mentioned throughout this Appendix. In addition, we believe that vehicle lighting standards (and ADB in particular) could be an excellent way for the agency to explore ways to recognize European vehicle standards as described[12] in the Framework Agreement between the U.S. and the EU announced in August 2025.[13]

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[7] https://www.regulations.gov/document/NHTSA-2022-0013-0001
[8] https://www.federalregister.gov/documents/2024/12/30/2024-31141/federal-motor-vehicle-safety-standards-lamps-reflective-devices-and-associated-equipment-adaptive
[9] https://www.regulations.gov/document/NHTSA-2022-0013-0001
[10] https://www.congress.gov/bill/117th-congress/house-bill/3684/text
[11] https://www.sae.org/standards/j3069_201606-adaptive-driving-beam
[12] "With respect to automobiles, the United States and the European Union intend to accept and provide mutual recognition to each other's standards."
[13] https://policy.trade.ec.europa.eu/news/joint-statement-united-states-european-union-framework-agreement-reciprocal-fair-and-balanced-trade-2025-08-21_en

While we encourage NHTSA to carefully consider each of the suggestions contained in this Appendix, the priority opportunities we urge NHTSA to address in the near-term are as follows:

1. Promulgate updated requirements to accommodate ADBs as identified in Auto Innovators' petition[14]
2. Modify requirements to allow horizontal adjustment for Visually Aimed Headlamps (VOA)
3. Remove or modify the minimum Effective Projected Luminous Lens Area (EPLLA) Requirements
4. Modify "steady burning" requirements and remove other barriers to deploying Emergency Stop Signals (ESS) and other emergency signaling functions
5. Modify Section 14.4.2 – Plastic optical materials tests
6. Modernize the requirements for front (parking) position lamps
7. Modify Section 9.4.1. (et al.) – Semiautomatic headlamp beam switching device
8. Modify the maximum allowable intensity for upper beam headlamps
9. Modernize requirements to better accommodate LED headlamps
10. Repeal Section 6.1.3.5 – Headlamp beam mounting
11. Harmonize Section 10 – Headlighting system requirements
12. Harmonize requirements for clearance and identification lamps
13. Harmonize test voltage for photometric tests

These strategies for improving FMVSS No. 108 help ensure a healthy and competitive U.S. auto industry, reduce regulatory burden by aligning with international standards, and maintain our leadership role in advancing safe vehicle designs domestically and globally.

[14] https://www.regulations.gov/comment/NHTSA-2022-0013-0013

FMVSS No. 108 Vestigial Provisions and Modernization Opportunities

Promulgate updated requirements to accommodate ADBs as identified in Auto Innovators' petition	
Vestigial Classification	2, 4
Vestigial Determination	Although FMVSS No. 108 was amended in 2022 to permit Adaptive Driving Beam (ADB) systems, the adopted test procedures and performance requirements do not allow deployment of ADB technology as designed and currently operating in other major markets (e.g., Europe and Japan). The rule's reliance on static, discrete photometric test points and prescriptive track-based compliance conditions reflects legacy assumptions from fixed-beam headlighting systems rather than modern camera-based, continuously adaptive glare management systems. Key limitations include: • The requirement to meet minimum illumination levels at fixed grid points during dynamic oncoming and preceding vehicle scenarios, rather than evaluating system-level glare control performance. • Restrictive test vehicle configurations and approach geometries that do not reflect real-world traffic conditions. • Absence of alignment with internationally harmonized performance-based standards (e.g., UNECE ADB frameworks), resulting in non-harmonized designs and delayed U.S. deployment. As a result, manufacturers cannot deploy globally validated ADB systems in the United States without substantial redesign, feature limitation, or performance reduction — undermining the safety and visibility benefits Congress sought to enable.
Recommended Regulatory Action	Amend FMVSS No. 108 to permit performance-based compliance pathways aligned with internationally harmonized ADB standards. Provide regulatory flexibility allowing vehicles certified under recognized international ADB performance standards to demonstrate equivalent compliance. Initiate rulemaking to streamline and modernize the ADB test procedure consistent with real-world operational design domains and current sensor capabilities.

Issue an updated FMVSS No. 108 test procedure	
Vestigial Classification	1, 2, 3, 4
Vestigial Determination	The current FMVSS No. 108 test procedure should be updated. It was developed around decades-old optical sensors and vehicle lighting technologies. There are also opportunities to clarify areas of the procedure to improve their compliance testing utility. In its December 2024 report to Congress, NHTSA indicated it was conducting research to support IIJA mandate Sec. 24212(b)(1) to issue performance-based headlamp standards and planned to issue an NPRM in the Summer of 2025 to fulfill the mandate.[15]
Recommended Action	Update test procedures as recommended in Auto Innovators' ANPRM response,[16] and Update, streamline, and modernize the FMVSS No. 108 test procedure,[17] and Publish any progress made under the contracts awarded upon Solicitation #693JJ924R000035[18] (detailed at C.6.3) by the lighting compliance testing contractors and NHTSA to develop two test procedures for measuring effective projected luminous lens area (EPLLA). NHTSA should publish research related to IIJA mandate Sec. 24212(b)(1) as it is completed to allow sufficient time for review prior to any NPRM publication. Doing so would maximize the lead time for industry and the public to digest and if necessary, validate the results before rulemaking begins.

[15] https://www.nhtsa.gov/sites/nhtsa.gov/files/2024-12/report-congress-status-rulemakings-december-2024.pdf
[16] https://downloads.regulations.gov/NHTSA-2020-0109-0008/attachment_1.pdf
[17] https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/tp-108-13_tag.pdf
[18] https://www.highergov.com/contract-opportunity/standards-enforcement-program-for-laboratory-test-693jj924r000035-o-7466f/

Reduce overall regulatory burden through improved alignment with international standards and requirements.	
Vestigial Classification	1, 2, 3, 4
Vestigial Determination	In many areas, FMVSS No. 108 sets forth a globally unique series of requirements for lamps, reflective devices, and associated equipment installed on U.S. vehicles. In certain cases, it would be beneficial to both industry and consumers for the NHTSA to recognize and/or allow manufacturers to deploy certain lighting solutions used globally in U.S. vehicles. Development costs for that equipment would largely have been absorbed, increasing design flexibility at lower prices for both manufacturers and consumers
Recommended Regulatory Action	Review FMVSS No. 108 for areas where the adoption or incorporation of international standards, particularly as alternative compliance options, would allow for an expedient introduction of more technologically advanced and potentially safer equipment in U.S. vehicles. NHTSA could allow manufacturers to deploy lighting equipment that complies with other accepted standards and requirements where technically appropriate, and safety is assured. This is akin to the Transport Canada approach for CMVSS No. 108 that allows manufacturers to meet FMVSS or UN ECE requirements. Some possible examples are: • UN R48, such as Emergency Stop Signal technology • UN R149, such as plastic material requirements, Adaptive Front-Lighting system (AFS) requirements, and photometric test methods for low beam and/or high beam or adaptive driving beams (ADB).

Remove license plate lamp requirements S7.7.15.4 - Incident light from single lamp and S7.7.15.5 - Incident light from multiple lamps.	
Vestigial Classification	3
Vestigial Determination	As states increasingly issue rear license plates that have printed identification characters instead of stamped raised characters, the issue of shadows potentially creating misidentification of license plate characters is greatly reduced. Prescriptive, outdated requirements like the minimum 8° incident light angle create testing and compliance burdens for manufacturers, which increases costs to consumers without added safety benefits.
Recommended Regulatory Action	Remove the 8-degree minimum incidence angle for license plate lamps.

Repeal Section 6.1.3.5 – Headlamp beam mounting	
Vestigial Classification	2, 3
Vestigial Determination	This section requires a vehicle's high beam to be mounted either below or inboard of the low beam, unless both functions are combined into one lamp cavity. This is unnecessarily restrictive from a vehicle design perspective and not supported by a safety need. High beam usage is typically regulated by each state.[19] In general, high beams are to be used only when no other road users are present in front of the vehicle. As a result, high beams are typically activated at distances where their mounting location has little relevance to the related low beam mounting location. Conversely, low beams are to be used when observers are present, and because front position lamps are required to operate simultaneously, the low beam does not need to serve as the vehicle's outermost visual boundary. Table I-A of the standard establishes reasonable restrictions on lamp separation and mounting height, making this needlessly restrictive from a vehicle design perspective. No further design restriction is warranted, and there are no known safety impacts due to mounting differences in other markets without such restrictions. The agency did not promulgate similar mounting location requirements for ADBs, which provides additional support for the repeal of this requirement. There are no requirements that ADBs are combined with low beam and/or high beam headlamps, and no requirements for ADB to be mounted in a specific location. In theory, a vehicle's ADB pattern could be produced by a separate lamp assembly and installed in a different location than the primary headlamps. If the mounting location for ADBs is not prescribed by FMVSS No. 108, it should not be prescribed for low and/or high beams.
Recommended Regulatory Action	Repeal section 6.1.3.5 to enhance design flexibility without compromising safety.

[19] www.yourmechanic.com/article/headlight-use-laws-for-all-50-states

Repeal requirements in Section 6.5.3.4 – Replaceable bulb headlamp markings	
Vestigial Classification	2, 3
Vestigial Determination	This provision requires permanent marking of certain replaceable bulb headlamps. The marking requirements have no effect on the safety of the lamps. NHTSA routinely grants petitions for inconsequential noncompliance for vehicles that do not contain the "HB" marking on the headlamp. Replacement lamps are generally marked with the ANSI designation, making the Section 6.5.3.4 marking requirements redundant.
Recommended Regulatory Action	Repeal the HB Type marking requirement in this section, which would translate to a reduction in manufacturing complexities and related costs with no effect on safety. It would also conserve Federal resources by eliminating the need to grant petitions on this issue**.**

Harmonize requirements for clearance and identification lamps	
Vestigial Classification	2
Vestigial Determination	Vehicles over 2032 mm wide, such as large pickup trucks, are required to have additional clearance and identification lamps installed to increase conspicuity and mark the dimension of the vehicle. In other markets, vehicles of similar sizes have slightly different requirements for marking vehicle width. Those markets allow vehicle dimensions to be effectively communicated through the placement of existing lamps – such as parking lamps, taillamps, and other end-outlines marking lamps – without mandating separate clearance and identification lamps. In practice, the safety purpose of the three identification lamps is increasingly unclear when vehicle width is already communicated through required clearance lamps or other lighting that outlines the vehicle's dimensions. Additionally, headlamps and other forward lighting already provide visual cues regarding vehicle size during operation. As a result, the requirements are misaligned with similar international standards and add unnecessary cost, complexity, and vehicle weight without demonstrated safety benefits. The functional safety value of the three identification lamps is especially unclear in modern vehicle designs. In practice, these lamps are sometimes installed on vehicles that share platforms with wider variants exceeding 2032 mm, even when the vehicle itself does not exceed the width threshold. In these cases, the lamps may not meaningfully communicate vehicle width to other road users. When clearance lamps already outline the vehicle perimeter, road users can readily perceive vehicle size without reliance on separate identification lamps. International standards take a more flexible approach. For example, UN-R 48 makes clearance or outline marker lamps optional for vehicles wider than 1800 mm and

	mandatory above 2100 mm, providing a more graduated and harmonized framework for communicating vehicle dimensions. Finally, the definition of "overall vehicle width" used in FMVSS No. 108 is not clearly specified and differs from international practice. UN regulations provide clearer guidance for determining width, including excluding the portion of the tire contacting the ground. The lack of clarity in the U.S. definition may introduce unnecessary compliance uncertainty, particularly when considering suspension settings and dimensional tolerances.
Recommended Regulatory Action	NHTSA should: -Update all FMVSS No. 108 references to a 2032 mm vehicle width to 2100 mm, which would harmonize the U.S. standard with the UN R48 designation of a "wide vehicle" and align requirements for "end-outline marker lamps." -Evaluate whether the three identification lamps remain necessary when vehicle width id already communicated through required clearance or end-outline marker lamps. -Clarify the definition of "overall vehicle width" in FMVSS No. 108 to align more closely with UN ECE definitions in order to remove ambiguity regarding measurement methodologies.

Modify the maximum allowable intensity for upper beam headlamps	
Vestigial Classification	2, 3
Vestigial Determination	The current allowable intensity for high beam headlamps is much less than international standards such as UN R149 permit. In situations where glare for oncoming drivers is not a concern, increasing the allowable maximum photometric intensity for high beams could offer increased driver visibility down the roadway and safety improvements for consumers.
Recommended Regulatory Action	Harmonize with UN R149 by increasing the maximum allowable intensity for the upper and lower beams when on vehicles equipped with permissible types of semi-automatic headlamp beam switching devices (including ADBs).

Modernize the requirements for front (parking) position lamps	
Vestigial Classification	2
Vestigial Determination	Modern designs often optically combine lighting functions such as Daytime Running Lights (DRLs), parking lamps, and turn signals. Though DRLs are permitted to extinguish when turn signals are activated, FMVSS No. 108 requires that parking lamps remain illuminated. This increases electronic design complexities and creates other engineering challenges that have the effect of increasing costs for consumers. In these optically combined devices, the turn signal is performing the primary function of the parking and tail lamps (indicating the presence and width of a vehicle). In addition, American drivers typically only use parking lamps in conjunction with lower and/or upper beam headlamps; in those cases, the headlamps are also indicating vehicle presence even if the turn signal flash cycle is in its OFF state. An analogous situation exists when rear turn and tail lamp functions are optically combined.
Recommended Regulatory Action	Allow front (parking) position lamps to extinguish when optically combined turn signals are active. Similarly, permit rear (tail) position lamps to extinguish when optically combined turn signals are active. Allow dimming of the DRL to parking lamp intensity instead of extinguishing them completely, since the parking lamp is permitted to be ON.

Modify 49 CFR Part 564 appendix for replaceable LED headlamp light sources	
Vestigial Classification	4
Vestigial Determination	FMVSS No. 108 establishes requirements and performance criteria for vehicles equipped with replaceable bulb headlamps. The allowable light source types for replaceable bulb headlamps are limited to those within 49 Part 564.[20] While Part 564 includes standardized categories for halogen and HID bulb types, there is no standardized category for the submission of design information for replaceable LED headlamp light sources. As a result, there is no regulatory mechanism for defining the dimensional, electrical, and performance characteristics of replaceable LED headlamp light sources in a manner that supports interchangeability and compliance with FMVSS No. 108. This discourages the development of standardized replaceable LED light sources, contributes to inconsistencies between OEM and aftermarket parts, and may increase overall equipment and repair costs by favoring non-replaceable headlamp designs.

[20] https://www.ecfr.gov/current/title-49/subtitle-B/chapter-V/part-564

Recommended Regulatory Action	Issue a new Appendix to 49 CFR Part 564 to serve as a repository for information on standardized replaceable LED light sources.

Modify Section 6.2 – Impairment	
Vestigial Classification	2, 4
Vestigial Determination	The current text, especially surrounding "effectiveness," is neither clear nor intuitive, which is burdensome for manufacturers attempting to make a determination on whether the effectiveness of required lighting devices is impaired when applying new designs and technologies. This determination of effectiveness may also involve the subjective judgement of observers. The ambiguity of this requirement and interpretation difficulty prevents manufacturers from introducing new technology used in other markets that could be helpful to road safety.
Recommended Regulatory Action	Modernize Section 6.2.1 in congruence with international standards such as UN R48 so that required signal lamps may exhibit alternate activation patterns (e.g., faster flash rates) in limited, safety-critical scenarios - such as significant deceleration, rear collision avoidance, post-crash or other stationary emergencies - without constituting impairment, provided the function does not alter lamp color, brightness, or location. This would be consistent with several past agency interpretations.[21] Alternatively, modify section 6.2 to clarify that non-emergency vehicles employing emergency lighting functions meeting UN R48 requirements are not subject to the impairment criteria in FMVSS No. 108.

[21] https://www.nhtsa.gov/interpretations/571108-help-system-powers

Modify requirements in Section 6.5.1 – DOT marking	
Vestigial Classification	3
Vestigial Determination	This provision requires the permanent marking of the "DOT" symbol on original and replacement headlamps, as well as on each original and replacement beam contributor and each replacement lens for integral beam or replaceable bulb headlamps. These markings do not impact the safety performance of the lamps while increasing manufacturing complexity and cost, particularly for lenses with complex designs or those made from delicate materials. Further, requiring these markings on headlamp lenses is inconsistent with other equipment practices. Similar markings are not required on center high mounted stop lamps (CHMSLs), DRLs, taillamps, or stop lamps, raising questions about the safety necessity for headlamps.
Recommended Regulatory Action	Allow the marking to be placed on another part of the headlamp that is visible while the equipment is installed in place, rather than on the lens. This approach would continue to meet the regulatory intent while reducing complexity and manufacturing costs, or Align with UN Regulations R148, R149, and R150, which permit markings provided they are clearly legible and indelible. This alignment would further support simplification and cost reduction. Note: In either case, NHTSA FMVSS No. 108 should be updated to clarify that it is permissible for the “DOT marking” to be visible while the equipment is installed in place, similar to section 3.3.5.2 of UN R149.

Modify requirements in Section 6.5.3 – Headlamp markings	
Vestigial Classification	3
Vestigial Determination	This provision requires that the lens of each original and replacement equipment headlamp, and of each original and replacement equipment beam contributor be marked with the name and/or trademark registered with the U.S. Patent and Trademark Office of the manufacturer of such headlamp or beam contributor, of its importer, or any manufacturer of a vehicle equipped with such headlamp or beam contributor. The prescriptive location required by the section is unnecessarily restrictive.
Recommended Regulatory Action	Allow the marking to be placed on another part of the headlamp that is visible while the equipment is installed in place, rather than only on the lens. This approach continues to meet the regulatory intent while reducing complexity and manufacturing costs, and/or Align these requirements with UN R148, R149, and R150, which permit markings as long as they are clearly legible and indelible. This alignment would further support manufacturing simplification and cost reductions. In either case, NHTSA FMVSS No. 108 should be updated to clarify that it is permissible for the "name or trademark of the headlamp or vehicle manufacturer" to be visible while the equipment is installed in place, similar to section 3.3.5.2 of UN R149.

Modify Section 9.4.1. (et al.) – Semiautomatic headlamp beam switching device	
Vestigial Classification	1, 2
Vestigial Determination	Originally created for 1960s technology, this section of the regulation mandates that automakers provide driver-adjustable "sensitivity control" for semi-automatic beam switching devices. At the time, such controls were necessary to compensate for limited sensor performance, but today's technology and control algorithms are greatly advanced by comparison. Modern systems can dynamically optimize performance in real time, eliminating the need for end users to adjust sensitivity settings for proper system function. Other regions of the world allow the installation of semi-automatic and fully automatic beam switching technologies without providing end-users the ability to reprogram or alter sensitivity settings. This approach reduces suboptimal user adjustments and ensures systems are functioning as vehicle manufacturers have designed them. The current regulation does not adequately reflect the capabilities of modern automatic lighting systems, including those integrated into ADAS and ADS platforms. These systems rely on real-time sensor input and software algorithms to optimize lighting performance dynamically, which is not contemplated fully in the existing FMVSS framework.
Recommended Regulatory Action	Update Section 9.4.1 and related provisions to remove prescriptive design requirements for driver-adjustable sensitivity controls and instead rely on existing performance-based requirements appropriate for modern beam switching technology, and Revise related testing and sensitivity provisions (e.g., section 14.9.3.11.2) to ensure consistency with updated section 9.4.1, and Expand the scope of Section 9.4.1 to explicitly include fully automatic lighting systems that operate without driver input, provided they meet performance-based criteria by harmonizing with UN R149 and other international standards that already accommodate such systems. Alternatively, make sensitivity controls optional rather than mandatory. Removing these requirements would increase design flexibility and potentially lower costs and improve equipment reliability, robustness, and consumer experience with these systems. In addition, safety may also be enhanced by reducing or eliminating the risk of end-user misadjustment.

Harmonize Section 10 – Headlighting system requirements	
Vestigial Classification	2, 3, 4
Vestigial Determination	This section establishes requirements for a vehicle's lower and upper beam headlamps to assure adequate road illumination. Permitted lamp types include standard sealed beam units, replaceable bulb type headlamps, integral beam type lamps, or combinations thereof. The requirements for each type vary depending on which of several categories the equipment falls into, the type of beam pattern that is created, how that pattern is to be aimed, etc. As currently drafted, the regulation significantly limits what equipment vehicle manufacturers can offer consumers to provide forward visibility. The design restrictions of each of these lamp types are not well aligned with what is permitted in other global markets. NHTSA requirements for adaptive front lighting systems are not harmonized with related, similar global requirements which offer potentially increased safety benefits.[22] The current structure of FMVSS No. 108 also does not support the integration of fully automatic lighting systems, which are increasingly standard in vehicles equipped with ADAS or autonomous capabilities. These systems can dynamically adjust beam patterns, intensity, and activation based on environmental and traffic conditions, enhancing safety and energy efficiency, but such functionality may be restricted by certain aspects of the existing regulation.
Recommended Regulatory Action	Permit the optional use of UN R149 approved lower beams and upper beams as well as automatic lighting systems, and Add a provision to Section 10 that would allow as an option for manufacturers the use of systems that comply with UN R149 when the relevant related requirements of UN R48 are also met on the vehicle. This revision would achieve significant cost savings for manufacturers and consumers and ensure FMVSS No. 108 allows for dynamic, sensor-based lighting control as part of a broader strategy to support autonomous and semi-autonomous vehicle technologies. Permit optional compliance with UN R148, R149, and R150 regulations surrounding adaptive front lighting systems. This revision would also achieve significant cost savings for manufacturers and consumers by reducing the development burdens surrounding these systems.

[22] https://www.iihs.org/news/detail/adaptive-headlights-help-drivers-spot-objects-earlier-glare-not-excessive

Modify the minimum Effective Projected Luminous Lens Area (EPLLA) requirements	
Vestigial Classification	2
Vestigial Determination	Despite being the topic of numerous academic and professional studies over the past several decades, no clear safety rationale can be found in the history of minimum EPLLA functional area requirements, which originated due to glare concerns surrounding high luminance small-area light sources. Other than a UN requirement surrounding DRLs, no such requirements currently exist in international regulations. The EPLLA of stop lamps and rear turn indicators in FMVSS No. 108 significantly exceeds the limits set by international standards such as UN R48, which means that manufacturers must often design larger lamps for the North American market. Requiring a lighting area that deviates from international standards forces manufacturers to develop market-specific designs for the U.S., increasing development costs and complexity —often without delivering any measurable safety benefit.[23]
Recommended Regulatory Action	Study the safety benefits of EPLLA thresholds to determine whether current U.S. requirements, UN R48 requirements related to effective light emitting surfaces, or other minimum thresholds of luminous intensity, luminance, or other criteria would be most appropriate for inclusion in FMVSS No. 108. Particular consideration should be given to the benefits of harmonizing with aspects of UN R48, which would allow for a reduction in the minimum allowable area for stop lamps and rear turn indicators on all vehicles. Introduce alternative compliance paths based on the results of that study, potentially including different EPLLA thresholds or another intensity measurement, and allow manufacturers flexibility to meet multiple compliance options. This would provide manufacturers with greater design flexibility while maintaining safety performance. By reducing EPLLA for stop and turn signals, the use of amber turn signals could also be further encouraged in the U.S. fleet. NHTSA research has indicated amber turn signals have the potential to reduce certain crash types.[24]

[23] https://wiki.unece.org/download/attachments/160694380/SLR-54-14_%28SAE%29_FMVSS%20-%20EPLLA%20Presentation%20for%20SLR-54.pdf?api=v2

[24] https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/811115

Modify Section 14.4.2 – Plastic optical materials tests (exposure tests)	
Vestigial Classification	2
Vestigial Determination	FMVSS No. 108 requires all plastic materials used in lenses to pass a three-year outdoor exposure test that must be conducted in Florida and Arizona. This requirement is impractical and burdensome.
Recommended Regulatory Action	To expand the available test locations and reduce burden, develop a standardized accelerated materials test as a compliance option, such as ASTM D7869 or ISO 4892-2A tests with SAE J576 evaluation criteria or JIS D-0205 or similar.

Modify Section 14.4.2 – Plastic optical materials tests (material limitations)	
Vestigial Classification	2
Vestigial Determination	When used in lenses, diffusion plastics can help provide a more uniform lighting appearance without jeopardizing the ability to meet the photometric levels required for certain functions. These materials are robust and proven to withstand weathering. Under the haze testing method, these plastics will automatically yield measurements below the aged material requirements, even when testing virgin material parts.
Recommended Regulatory Action	Modify the definition of haze to clarify that it is not a property of a virgin material. For example, clarify that haze refers to the optical scattering measured using the ASTM D1003 test method, which is intended for transparent materials. Specify that diffusive plastic materials identified in ASTM D1003-92 as unsuitable for the test method are exempt from the haze requirement, consistent with SAE technical committee recommendations. Modify section 14.4.2 for diffused plastic materials to promulgate alternative compliance requirements similar to UN-R 149, which does not contain similar requirements, or the most recent SAE Recommended Practice J576, which does not contain the 3 year exposure haze requirement.[25] There are no known safety disbenefits to using diffusion plastic materials for optical lenses tested to SAE J576, which can provide better visibility of vehicle signal and marking functions at various inboard and outboard viewing angles. Apply haze requirements only to lenses covering the functional areas of low beams, high beams, adaptive driving beams, reflex reflectors, and conspicuity materials, excepting lenses used in signal and marker lamp functions from those requirements.

[25] https://www.sae.org/standards/content/j576_196001/

Modernize requirements to allow greater flexibility to incorporate logos into lamps	
Vestigial Classification	4
Vestigial Determination	Modern vehicle designs often integrate lighting functions such as taillamps and high mounted stop lamps into brand elements like illuminated logos. However, requirements in Table I-A, such that two tail lamps are needed and must be symmetrically positioned about the vertical centerline, restrict the use of asymmetrical illuminated logos (such as brand names). This limitation establishes a barrier to innovative designs without offering any direct safety benefit.
Recommended Regulatory Action	Establish a definition of "logo" and clarify how a logo could be incorporated to a lamp within FMVSS No. 108 to allow for symmetrically mounted lamps with asymmetrical interior structure and preempt state requirements that prohibit such illuminations on certain vehicles.[26] This provides design flexibility regarding the symmetry requirement for OEMs whose brand names are part of the lighting function; this would provide greater design flexibility without decreasing safety.

Modify "steady burning" requirements and remove other barriers to deploying Emergency Stop Signals (ESS) and other emergency signaling functions	
Vestigial Classification	2
Vestigial Determination	FMVSS No. 108 states that all lamps must be steady burning in use unless otherwise explicitly permitted. FMCSA has granted motor carrier exemption requests to allow pulsating brake lights on heavy vehicles.[27] NHTSA's interpretation appears to only allow manufacturers to deploy these lighting systems if they are automatically activated when a disabling crash occurs to a vehicle, and does not appear to permit systems that are activated in cases of high deceleration braking.[28] Emerging research, including NHTSA's own study, shows that flashing signals used as rear lighting systems have the potential to redirect a following vehicle driver's gaze forward, which can provide safety benefits over steady-burning brake lights.[29] Since there is no clear definition of steady burning in the standard, it is difficult to determine whether a certain type of lamp activation is considered to be steady burning or not, which has necessitated asking NHTSA for interpretations to inform compliance. These interpretations, while appreciated, create some difficulty in the

[26] https://www.palegis.us/statutes/consolidated/view-statute?txtType=HTM&ttl=75&div=00.&chapter=043.&section=007.&subsctn=000.#:~:text=(a)%20General%20rule.,stating%20its%20use%20or%20destination.

[27] https://www.fmcsa.dot.gov/exemptions#:~:text=Exemption%3A%20This%20exemption%20allows%20motor,the%20steady%2Dburning%20brake%20lamps.

[28] https://www.nhtsa.gov/interpretations/571108-help-system-powers

[29] https://www.nhtsa.gov/sites/nhtsa.gov/files/811127.pdf

	application of the steady burning headlamp requirements in certain situations, including but not limited to instances where electrical system voltage can be expected to momentarily drop, such as when a vehicles is stationary for a period of time on the road (parked on the shoulder or roadside) or during “warm engine cranking” of vehicles equipped with start-stop engine systems. It should not be necessary for headlamps or any other required lighting device to maintain light intensity when system voltage is temporarily reduced, and costly countermeasures are being added to current vehicles to meet the “steady burning" requirement. If headlamps are activated at the minimum level of intensity required by the standard, they can provide adequate visibility for other vehicles and for a vehicle operator. NHTSA has explained “steady” in multiple interpretations, including but not limited to: • "Steady means that they must not modulate, flash, or vary in size, area, intensity or appearance." (98FR 29470, May 23, 2005). • "A light that is essentially unvarying in intensity" (interpretation letter to Dr. H.A. Kendall, February 9, 1982). NHTSA has attempted to clarify the steady burning requirement in other interpretations as follows: • "Although a modulating headlamp technically is not a steady-burning one, for purposes of this requirement under S5.5.10(d), we have concluded that there is no failure to conform if the modulating light from the lamp is perceived to be steady burning." (to Mr. Joe de Sousa, March 10, 1994). • "A DRL with a gradational feature would continue to provide the steady-burning light that is required for DRLs. The standard does not prohibit changes in intensity, which we presume will be within the parameters of the minimum and maximum values of candela specified." (to Mr. Ian Goldstein, July 21, 1998). • "If an intensity-reducing headlamp operates in a manner that meets all of the other applicable requirements of the standard and is perceived as being steady-burning, we believe that such a design would be permissible under the standard." (to Mr. Kiminori Hyodo, November 5, 2005).
Recommended Regulatory Action	Develop and include in FMVSS No. 108 a clear definition for “steady” to improve the ability for manufacturers to interpret and apply the requirements. This could include incorporating interpretations to the regulatory text, and Eliminate "steady burning" requirements so that the light intensity of lamps may be dynamically adjusted within the range allowed by the standard without restriction, such as a gradual change when the vehicle is not driving.[30] Remove the restriction that all stop lamps must be steady burning and allow manufacturers to deploy, as an explicit compliance option, pulsating brake lamp and turn signal lamp technology for high deceleration braking events such as

[30] Driving is defined in NHTSA's Driver Distraction Guidelines; the same definition can be used for this purpose.

	Emergency Stop Signals (ESS) that are now required in Europe.[31] Allowing this technology increases design flexibility and consumer choice and may result in safety improvements. Harmonization with other regions' requirements reduces manufacturing complexity and can also result in reduced consumer costs. It would also conserve Federal resources by eliminating the need to grant petitions on this issue while maintaining a level of safety equivalent to or greater than that achieved with steady burning stop lamps. Modernize FMVSS No. 108 to affirm the permitted use of existing required rear lamps such as turn signals, signature lamps, brake lamps, and tail lamps at elevated flash rates during defined emergency conditions, such as vehicle disablement, crash events, and other disabling vehicular events where the primary objective becomes signaling a hazard or emergency to drivers approaching the vehicle.

Modify the definition of vehicular hazard warning signal operating unit	
Vestigial Classification	2
Vestigial Determination	Vehicular hazard warning signal operating unit is defined as "a driver-controlled device which causes all required turn signal lamps to flash simultaneously to indicate to approaching drivers the presence of a vehicular hazard." This definition restricts the automatic activation of hazard warning signals, which could be helpful in certain situations. NHTSA mentioned in a 2016 interpretation[32] that "NHTSA may also consider amending the relevant provisions of FMVSS No. 108 at some point in the future in order to clarify situations when hazard lights may activate automatically" but amendments of that nature have not yet been pursued.
Recommended Regulatory Action	Modify the definition of "hazard warning signal" to clarify that hazard warning operation may include the activation of turn signals and stop lamps. In doing so, NHTSA should clarify whether the definition continues to exclude CHMSLs or whether their use is also permitted as part of hazard warning signaling. Additionally, allow auxiliary or automatically activated hazard-like signaling functions to alert other drivers or other road users when vehicle is not in a drivable condition, especially by harmonizing with the definition and usage of the hazard warning operating units permitted within the UN-R framework. Specifically, NHTSA should allow: • Automatic activation of hazard-like signal systems in response to vehicle sensor-detected scenarios, such as (but not limited to) sudden deceleration, collision detection, or system-diagnosed vehicle disablement.

[31] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R2144&from=EN
[32] https://www.nhtsa.gov/interpretations/16-1289-gm-hazard-innovative-28-apr-16-rsy

	• Multiple modes of emergency alerting (e.g., standard 1-2 Hz vs. enhanced conspicuity 4.0 Hz ± 1.0 Hz). • The use of separate control interfaces or automated activation pathways for auxiliary emergency signaling functions to reduce driver confusion. These changes would better accommodate modern vehicle safety systems and align U.S. requirements with international regulatory frameworks while improving conspicuity when vehicles are disabled or experiencing emergency conditions.

Modernize rear reflex reflector requirements	
Vestigial Classification	3
Vestigial Determination	Rear reflex reflectors are required to be mounted 15 inches above the ground or higher. The geometric center of the reflector is used as the point of reference to determine if the reflector is mounted properly. In reflectors that protrude below the threshold, it's possible that the additional reflective area can take the reflector below the minimum mounting height even if the portion above 15 inches is still compliant. In some cases, manufacturers may need to remove reflective areas below the minimum mounting height to keep the geometric center of the reflector above 15 inches. If additional reflective area is desired by the manufacturer, it must be installed as a separate component instead of having one continuous reflector. This complicates product design and manufacturing without adding additional safety benefits, which increases costs for manufacturers and consumers.
Recommended Regulatory Action	Allow manufacturers to install continuous reflectors as long as the portion meeting photometric requirements has a geometric center above the minimum mounting height required currently in FMVSS No. 108.

Modernize requirements to better accommodate LED headlamps	
Vestigial Classification	2, 4
Vestigial Determination	Most headlights today utilize LED light sources for their low and high beam lamps. As LED light sources have not yet been standardized, manufacturers are required to designate LED headlamps as integral beams under FMVSS No. 108. Integral beam headlamps cannot have individual components related to the headlamp replaced such as the light source or control units. Anytime there is a failure in the headlamp (e.g., if the low beam headlight is not functioning properly), the entire headlamp assembly must be replaced. This leads to much higher replacement lamp costs in newer vehicles than in older vehicles, which more commonly used replaceable bulb type lamps. As LED technology becomes even more prevalent, the ability to change the individual components of an integral beam headlamp, including light sources, is desired. This would limit service part costs for manufacturers and consumers.
Recommended Regulatory Action	Modernize FMVSS No. 108 to better accommodate LED headlamp designs, potentially by establishing a definition and unique requirements for multiple light source headlamps to reduce the need to use integral beam regulations and related interpretations for LED headlamp compliance, [33] or Incorporate LED-related requirements that are harmonized with UN R48, allowing multiple LEDs to be wired more independently so that the failure of an individual LED does not require the entire lamp to be extinguished, provided that the failure is indicated by visual means like a telltale. Alternatively, minimum photometric intensity requirements could be maintained, or a specified percentage of operating elements could be required to remain functional until full performance is restored.

[33] https://www.nhtsa.gov/interpretations/ledlamp1

Modernize FMVSS No. 108 to support ADS and ADAS lighting functions	
Vestigial Classification	2
Vestigial Determination	FMVSS No. 108 was developed with the assumption that a human driver would primarily be manually operating lighting systems. This creates regulatory uncertainties for vehicles equipped with ADAS or ADS, which rely on automatic lighting functions for safe operation. These functions include automatic activations of turn signals, hazard lights, and adaptive headlamps. Many modern vehicles equipped with ADAS or ADS can already initiate lane changes, overtaking maneuvers, or lane departure corrections, and could benefit from automatically activating direction indicators to signal intent to other road users. The current standard and some interpretations[34] can be read as broadly restricting automatic signal activations. FMVSS No. 108 also lacks alignment with international regulations that already support such systems, which increase safety and align with trends toward automation and predictive safety systems. In addition, FMVSS No. 108 does not clearly permit external marker lamps intended to communicate the operational status of automated driving systems. Industry standards such as SAE J3134 have begun defining ADS marker lamps to signal when a vehicle is operating in an automated driving mode. The absence of clear federal permission for such lamps may discourage deployment and could lead to inconsistent state requirements or interpretations regarding their use.
Recommended Regulatory Action	Modify FMVSS No. 108 to explicitly allow automatic activation and/or deactivation functions such as the following (not an exhaustive list): • Automatic activation of turn signals during ADAS-initiated lane changes, lane departure correction, emergency steering assist, or overtaking, • Autonomous driving mode transitions and optional Automated Driving Mode indicators such as described in SAE J3134 (ADS Marker Lamps) that communicate the operational status of an automated driving system, similar to the regulatory treatment of daytime running lamps (permitted but not required). • Fully automatic headlamp control, including adaptive beam switching. Alternatively, permit optional compliance with international standards such as UN R48 and R149, which already support automated lighting functions and contain methods to ensure that automatic activation is accompanied by appropriate driver override and indication mechanisms to maintain transparency and support driver awareness.

[34] https://www.nhtsa.gov/interpretations/ncc-230607-001-571108-automatic-activation-hazard-warning-signal-nonresponsive

Modify requirements to allow horizontal adjustment for visually aimed headlamps (VOA)	
Vestigial Classification	1, 2, 3, 4
Vestigial Determination	FMVSS No. 108 currently prohibits horizontal adjustment for visually/optically aimed (VOA) headlamps unless a horizontal Vehicle Headlamp Aiming Device (VHAD) is used. This restriction is based on the assumption that VOA headlamps lack visual cues for horizontal alignment. However, modern headlamp designs can incorporate such cues without compromising beam performance. The restrictions surrounding horizontal adjustment limits unless VHADs are used prevent harmonization with international practices and complicate the use of common headlamp designs across global markets. This significantly increases both component and development costs. The VHAD option is not attractive due to its cost, complexity, limited accuracy, and declining use in the industry. European-style mechanical horizontal adjusters are simpler and more effective but do not meet the current VHAD requirements under FMVSS No. 108.
Recommended Regulatory Action	Consider eliminating VHAD requirements altogether or otherwise harmonizing with ECE regulations that allow both vertical and horizontal visual aiming, enabling manufacturers to use a single headlamp design globally, or Permit the use of simplified mechanical horizontal adjusters (as used in Europe) as an alternative to VHADs. Alternatively, amend S10.18.4 to explicitly allow horizontal adjustment capabilities for headlamps, provided the beam pattern includes standardized visual cues that enable accurate horizontal aiming and can potentially be integrated into VOA beam patterns without degrading photometric performance. Visual cues for horizontal aim have been accepted in Europe and other markets for decades. Otherwise, explicitly allow for a special simplistic beam pattern (“aiming mode”) to be produced only when the vehicle is parked to assist in proper horizontal aim without VHAD. Each of these four options, or any combination thereof, could include corresponding information in vehicle documentation that provides consumers with information on achieving proper horizontal aim.

Modernize the standard to enable enhanced vehicular hazard signaling	
Vestigial Classification	2
Vestigial Determination	First introduced as a federal requirement in 1968, the hazard warning system was designed around the technological constraints of the time. These constraints included the use of mechanical relays and incandescent bulbs, leveraging existing turn signal hardware to produce a simple flashing effect. As a result, the system's flash rate was standardized within the relatively limited range of 1 to 2 Hz. However, subsequent research and real-world applications have demonstrated that higher flash rates, typically between 4 and 6 Hz, are significantly more effective in attracting attention and signaling urgency to oncoming drivers of a stationary, vulnerable vehicle ahead and with no discernable disbenefits. Modern vehicles, now equipped with advanced lighting technologies such as LEDs, are fully capable of operating at these higher and more safety-beneficial frequencies, offering enhanced conspicuity in emergencies or high-urgency scenarios that demand greater visibility than standard turn signals.
Recommended Regulatory Action	Update FMVSS No. 108 to better accommodate enhanced vehicular signaling in emergency and system-detected failure applications by modernizing the standard to permit non-steady, conspicuity-enhancing signal flash rates of 4–6 Hz under defined emergency or crash conditions, using existing exterior vehicle lamps. These signals should be permitted to activate: (a) automatically after a significant crash or other vehicle-sensed disabling event, (b) conditionally when vehicle is stationary, hazard lamps are active and the vehicle is in park, and (c) through a secondary, clearly distinct control interface. This would bring FMVSS No. 108 into closer alignment with global best practices, such as UNECE R48, R131, and R148, which permit the flashing of lamps at 4.0 Hz ± 1.0 Hz under certain elevated hazard situations that benefit from the increased conspicuity over the standard 1 - 2Hz flash rate. The benefits of higher flash rates are well supported by previous NHTSA interpretations to FMVSS No. 108,[35] WP.29 Guidelines on establishing requirements for high-priority warning signals,[36] and Virginia Tech Transportation Institute (VTTI) efficacy studies.[37]

[35] https://www.nhtsa.gov/interpretations/571108-help-system-powers
[36] https://unece.org/DAM/trans/doc/2011/wp29/ECE-TRANS-WP29-2011-90e.pdf
[37] https://cdn.prod.website-files.com/60b5c894a4280bd54e3777b9/6296694d067ec12e539d31af_ess-help.com-vtti-phase-2-study-final.pdf

Modernize requirements surrounding the use of lamps on movable components	
Vestigial Classification	3, 4
Vestigial Determination	Methods for assessing the compliance of lamps installed on movable components are not explicitly defined in FMVSS No. 108. Nevertheless, these lamps must comply with applicable photometric and visibility requirements. One such example would be Center High Mount Stop Lamps (CHMSL) located on spoilers or convertible roof mechanisms. Conversely, UN R48 stipulates that lamps on movable components are required to satisfy geometric visibility, colorimetric, and photometric criteria solely at their fixed reference positions.
Recommended Regulatory Action	Modernize FMVSS No. 108 by adding and clarifying requirements for lamps on movable components, in harmonization with UN R48, which reduces testing cost and compliance burdens.

Modify center high-mounted stop lamp (CHMSL) requirements	
Vestigial Classification	3
Vestigial Determination	FMVSS No. 108 requires that center high mounted stop lamps (CHMSLs) provide access for replacement of the light source without the use of special tools. This requirement reflects legacy designs that relied on replaceable bulbs. Modern CHMSLs, however, do not utilize replaceable light sources and the entire lamp assembly is replaced if lamp damage should occur. FMVSS No. 108 also prohibits high-mounted stop lamps from being optically or physically combined with any other rear vehicle lamp except for cargo lamps. This restriction also reflects earlier lamp designs where individual lighting functions were typically housed in separate assemblies.
Recommended Regulatory Action	NHTSA should update FVMSS No, 108 to better reflect modern rear lighting technologies by addressing two legacy requirements applicable to CHMSLs: • Revise S6.1.3.4.2 to clarify that the requirement for access to replaceable bulbs without special tools applies only to CHMSLs that utilize separately replaceable light sources. This provision should not apply to modern light sources such as LEDs where the entire lamp assembly is replaced as a whole component. • Permit the optical and physical combination of CHMSLs with other lamps, similar to UN R48, which does not contain such restrictions, by deleting the prohibition in 6.3.1 that prevents them from being optically or physically combined with rear vehicle lamps (except cargo lamps). Allowing such combinations would align FMVSS No. 108 with international practices.

	These changes would modernize FMVSS No. 108 to better reflect current lighting technologies.

Modernize driver assistance projection and signal projection requirements	
Vestigial Classification	4
Vestigial Determination	FMVSS No. 108 does not regulate driver assistance headlamp projections (i.e. warning symbols) or projections from signaling devices, like turn signal indicators or reversing lamps in the form of patterns on the ground. These projections enhance drivers' and road users' abilities to perceive vehicle cues and signals. Several of these projection types have recently been made permissible in Europe, and the SAE Lighting Systems Group is currently developing a standard which may have broad appeal in the U.S. market.
Recommended Regulatory Action	Modernize FMVSS No. 108 by allowing vehicles to emit driver assistance projections and other signal projections to roadway surfaces for drivers and other road users in harmonization with UN R48 and/or SAE J3308.

Modify the minimum intensity requirements for amber rear turn signal lamps	
Vestigial Classification	3
Vestigial Determination	FMVSS No. 108 requires different minimum intensities for red and amber rear turn signal lamps, as specified in Table VII. The minimum intensity for amber rear turn signals is much higher than for red rear turn signals and significantly higher than amber rear turn requirements in UN R148. This drives up costs for amber turn signals in the U.S. market and creates an unnecessary design and testing burden without necessarily improving safety, since reductions in rear impact crashes related to this equipment have been attributed to the color contrast between amber rear turn signals and red stop lamps rather than the lighting intensity of either component.[38]
Recommended Regulatory Action	Amend Table VII to reduce the minimum intensity requirements for amber rear turn signal lamps, ideally to match those in UN R148. This could lower design, development, and production costs and may also lead to rear impact crash reductions from potentially increased amber rear turn signal deployment in U.S. vehicles.

[38] https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/811115

Modify requirements surrounding lighted sections and compartments	
Vestigial Classification	4
Vestigial Determination	When multiple compartment lamp or multiple lamp arrangements for turn signal lamps, stop lamps, or taillamps are used, EPLLA requirements are determined depending on the number of compartments and photometric requirements are applied depending on the number of lighted sections. Signal and marker lamps can now be created in a variety of sizes and shapes and illuminated by multiple light sources which may be placed at a distance from each other and the regions an observer would see illuminated. Compared to traditional bulb-based lamps, modern equipment designs are more technologically complex and diverse. These existing definitions and requirements do not readily map to modern lamp designs, so it is often unclear how the requirements should be interpreted for newer technologies versus traditional bulb-based designs. This creates unnecessarily complex interpretations of product compliance and potentially stifles innovation. In the case of lamps consisting of multiple LEDs, to be considered a single lamp or one lighted-section lamp, multiple LEDs must be wired in series. This results in fully functioning LEDs extinguishing should any single LED fail. The loss of an entire lamp due to one LED failing decreases visibility unnecessarily, and potentially decreases road safety.
Recommended Regulatory Action	Modernize photometry and EPLLA definitions and requirements for multiple compartment lamps and multiple lamp arrangements such that they are harmonized with UN R48 (single lamp requirements), or Specify that requirements for a single lamp include the ability to combine different light sources or an assembly of two independent lamps (like S4. Definitions. Multiple lamp arrangement) to one lighting function, independent of compartments. The photometric requirements for a single signal lamp can then apply, including that the failure of the lamp function would be indicated to the driver as required in S9.3.6 Turn signal lamp failure, or Modernize definitions and requirements to accommodate LED and other advanced lighting technology designs without separate rules for compartments or lighted sections. This would increase the clarity of the compliance requirements and potentially increase safety by maintaining higher levels of vehicle conspicuity and signaling than currently allowed when discrete light source malfunctions occur. The allowable behavior of a lamp consisting of multiple LEDs should be harmonized with UN-R 48; in the event of any single LED failure, it should not be required to deactivate the LEDs that continue to operate correctly. It would be sufficient to indicate the issue to the driver via a tell-tale or an error message.

Harmonize test voltage for photometric tests	
Vestigial Classification	2, 4
Vestigial Determination	FMVSS No. 108 requires performance tests for certain lamps to be carried out with 12.8V. At present, however, an on-board electrical system with 48V is increasingly being deployed in vehicles. A 48V lamp will not pass the tests if it is only driven by 12.8V. As a result, the vehicles must be equipped with a separate 12V on-board electrical system only for the performance of the test and the lights may continue to be operated only with 12V.
Recommended Regulatory Action	Revise FMVSS No. 108 to be analogous to similar requirements in UN-R 148/149, such as: "All measurements on lamps shall be made with the input voltage as specified by the manufacturer."

Appendix C:

Request for Interpretation Involving Vestigial Provisions and Modernization Opportunities

January 12, 2024

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Porsche Cars North America, Inc. Request for Interpretation of FMVSS 135, S5.2 Parking Brake System.

Dear Mr. Donaldson,

Porsche submits this request for interpretation seeking NHTSA's concurrence that the parking brake system discussed in this letter is, by design, capable of satisfying Section 5.2 of FMVSS 135 which requires vehicles subject to the standard to be equipped with a parking brake system of a friction type with solely mechanical means to retain engagement.

1. Overview of FMVSS 135, S5.2, Parking Brake System Requirement

FMVSS 135 S5.2 reads as follows:

> *Each vehicle shall be equipped with a parking brake system of a friction type with solely mechanical means to retain engagement.*

In FMVSS 135, it is stated that compliance with S5.2 is to be verified in accordance with **S.7, Road test procedures and performance requirements**. S7.12 contains the test procedure and performance requirements for the parking brake system. It reads as follows:

> *S7.12.3 Performance requirement: The parking brake system shall hold the vehicle stationary for 5 minutes in both a forward and reverse direction on the grade.*

As described in S7.12.2 (parking brake system test procedure), the performance of the parking brake system is tested with the vehicle driven onto a slope having a grade of 20%. The vehicle is placed into neutral gear, the service brake is applied, the parking brake is applied, then the force on the service brake control is released. The start of the time measurement then commences.

Compliance with S5.2 of FMVSS 135 can be confirmed using NHTSA's Laboratory Test Procedure for FMVSS 135 Light Vehicle Brake Systems, Dec. 2, 2005 (TP-135-01). Consistent with S5.2 of FMVSS 135, S14.24.3 of TP-135-01 calls for the tester to *verify that each vehicle is equipped with a parking brake system of a friction type with solely mechanical means to retain engagement*.

2. The History of the S.5.2 Parking Brake System Requirement

FMVSS 135 (*Passenger Car Brake Systems*) was originally published in the Federal Register on February 2, 1995 (60 FR 6411). FMVSS 135 replaced FMVSS 105, *Hydraulic Brake Systems*, as it applies to passenger cars. The requirement in FMVSS 135 which states that the parking brake system is to be of a friction type had its origin in the first version FMVSS 105 which was established February 3, 1967[1]. To understand the intent of the "friction type" requirement, it is useful to examine the original language of FMVSS 105 as it existed in 1967.

When FMVSS 105 was created in 1967, the stated purpose of the standard was to prevent a rupture or leakage-type failure of the service brake system from resulting in a complete loss of function of the brakes. It was, in essence, an acknowledgement that brake systems of that era were susceptible to complete system failure. FMVSS 105 contained a parking brake system requirement (S4.3) which read as follows:

> S4.3 *Parking brake system*. A parking brake system of a friction type with a solely mechanical means to retain engagement shall be provided that will hold the vehicle loaded in accordance with SAE Recommended Practice J843a, June 1966, to the limit of traction of the braked wheels in both forward and reverse directions on clean, dry, smooth, *Portland cement concrete pavement* (or other surface with equivalent coefficient of surface friction) of a 30 percent grade.

Had the Department only been concerned with rollaway prevention, S4.3 could have been written in a different manner. First, it could have been written as a requirement for the "parking brake" instead of "parking brake system." Second, it could have omitted the "friction type" language as there is no engineering basis for specifying a design requirement such as "friction type" for purposes of rollaway prevention. A mechanical means to lock the axles would have been sufficient. The Department instead specified a more complex "system" requirement acknowledging the reality that brake systems of that era were prone to total failure. In establishing a "parking brake system" requirement and by specifying it be of a "friction type," the Department provided an additional means of bringing a vehicle to a stop in an emergency situation while also establishing a performance standard for rollaway prevention.

[1] February 3, 1967, 32 FR 2408

In 1985 (18 years after the establishment of FMVSS 105), NHTSA proposed to establish a dynamic stopping test for the parking brake (identical to an existing UNECE test procedure). This was clearly evidence that in the period leading up to this proposal (especially in the '70s), the parking brake system continued to be designed to be used for emergency braking (hence the friction requirement). Twenty-four years after NHTSA established the parking brake system requirement in FMVSS, it published in SNPRM in 1991 indicating that complete brake system failure was no longer a concern and that establishing an additional dynamic parking brake system performance requirement was unnecessary[2]. That SNPRM included a statement to the effect that the parking brake is for static situations such as parking and not dynamic ones and that it is not designed to act in dynamic emergencies. We believe that this statement was later taken out of context by then NHTSA Chief Counsel Franke Seales, Jr. when responding to a letter from Mr. Peter Bohm, Manager Regulations, ITT Automotive Europe GmbH asking whether a parking brake system being developed by ITT might comply with the requirements in paragraph 5.2 of FMVSS 135. In telling ITT that their interlock device designed to prevent vehicle rollaway would not satisfy Section 5.2 of FMVSS 135, Mr. Seales referenced opinions of commenters to the 1985 NPRM who stated that the purpose of the parking brake is to statically hold a vehicle in place, not to decelerate a moving vehicle. While it was true that the parking brake's main function was to statically hold a vehicle in place, it was false, misleading, and ignoring decades of history to ignore the fact that the parking brake had a secondary purpose, emergency deceleration (which required the parking brake system to be of a friction type).

In his response to ITT, Mr. Seales also wrongly wrote that "Standard No. 135 requires the parking brake to be of a friction type." This statement was false. As we discuss in Section 2 above, FMVSS 135 S5.2 reads as follows:

> *Each vehicle shall be equipped with a parking brake **system** of a friction type with solely mechanical means to retain engagement.*

Contrary to the statement made by Mr. Seales, S5.2 does not require the "parking brake" to be of a friction type. Instead, it requires the "parking brake **system**" to be of a friction type. This is further evidence that, in formulating his response to ITT, he failed to comprehend the full history of the parking brake system requirement and the exact purpose and intent of the authors when they created FMVSS 105 in 1967.

3. Conventional Parking Brake Systems

Most of today's conventional parking brake systems continue to rely on the service brake system components to prevent vehicle roll-away. Typically, vehicles use either a hand-operated parking brake lever or an electronic control to actuate braking mechanisms (e.g., calipers or shoes) to prevent the vehicle from rolling. While these systems are highly reliable, performance degradation can occur when the friction linings are worn or under fluctuating operating conditions which may cause the friction brake components to expand and contract. Component temperature changes (which can impact

[2] Wednesday, July 3, 1991, page 30537

component dimensions and friction characteristics) can reduce the applied clamping force and result in a reduced ability to hold the vehicle on a severe grade.

Because conventional parking brake systems rely on the service brake system components, the potential for design and performance conflicts exists, especially in consideration of advanced technology vehicles. In the case of vehicle electrification, the addition of vehicle batteries tends to increase vehicle weight (compared to conventional powertrain variants). Weight increases are also realized because of the demand for Advanced Driver Assistance Systems (ADAS) which requires more sensors, cameras, wiring, computers, etc. All of the additional life-saving and fuel saving technologies increase weight which requires parking brake systems to have a more robust design. Fortunately, there are weight savings to be realized with electric vehicles. For example, with regenerative braking, some of the vehicle's momentum is reduced via the regenerative braking system components. This means that the demand on the electric vehicle's conventional service braking components is reduced, thus allowing parts such as brake rotors to be lighter. However, this cannot be realized given the parking brake system components must be larger and heavier to handle the overall increased weight associated with batteries and other components on advanced technology vehicles.

Hence, for both safety and fuel efficiency reasons, there is a desire to have a parking brake system that does not rely on the friction components of the service brake system for roll-away prevention.

4. Porsche's next generation parking brake system

Porsche's next generation parking brake system would be comprised of two sub-systems, one of which is a friction type system. The parking brake system, in totality, can thus be said to be of a friction type design. For roll-away prevention, the system would rely on two locking devices. One locking device would be the gear shift interlock (pawl) applied to the drive axle (as is currently the case on conventional vehicles). A second locking device would prevent the wheels from rotating relative to one another, to prevent rollaway when one wheel is on ice. Alternatively, each wheel could have its own mechanical locking device. Unlike the service brake friction components relied on for today's roll-away prevention, the performance of the positive lock (i.e., a highly reliable, time-tested, durable mechanism) augmented by the secondary lock would not be susceptible to extreme temperature, usage, or environmental conditions (e.g., ice buildup).

The parking brake locking device would be activated by the driver via a hand-operated control (as found in conventional vehicles today). Like with electric parking brakes of today, the brake cable running from the conventional hand-operated parking brake lever to the service brake system components would be eliminated.

Not unlike what is already available on Porsche vehicles in production today, Porsche's next generation parking brake system would also include a separate subsystem that would rely on the Electronic Stability Control (ESC) system to decelerate the vehicle using traditional friction-type components (e.g., rotors and pads or brake shoes and drums) of the service brake system in emergency situations. This feature is activated via the driver-operated parking brake control. The amount of deceleration available for emergency braking via the ESC system (activated via the parking brake control) is significantly greater than what is achievable with parking brake systems that do not rely on the ESC system for

decelerating the vehicle via the parking brake control. Such a system can be used in unusual events when, for example, the driver is unable to apply force to the foot pedal that activates the service brake system.

5. Compliance with S.5.2

As discussed above, S5.2 of FMVSS 135 states that each vehicle shall be equipped with a *parking brake system* of a friction-type with solely mechanical means to retain engagement.

The question arises, does the future parking brake system described above in Section 6 satisfy this requirement? In other words, does the *parking brake system* contemplated include a friction-type component and have a solely mechanical means to retain engagement? We believe the answer to be "yes."

As discussed above, the ***parking brake system*** would be comprised of two sub-systems. One of the sub-systems would rely on the actuation of friction-type components of the service brake system (via the ESC system). Considering the friction-type requirement of S5.2 exists not because of the grade holding requirement (see Section 3 history discussion), but instead because of the indirect desire to provide backup emergency braking capability, we believe that friction-type components used to provide emergency stopping functionality in modern parking brake systems satisfy the original intent of the standard. As evidence that the friction-type requirement was in fact only of importance to NHTSA for emergency braking, we reference the preamble discussion found in the 1973 final rule (38 FR 13020) responding to petitions for reconsideration filed in response to the 1972 final rule establishing FMVSS 105a. As discussed there, both General Motors and Chrysler requested NHTSA eliminate the friction type requirement. NHTSA, however, denied the request in 1973 on the grounds that a pawl type parking brake cannot provide the residual stopping capability that may be useful in the case of complete loss of service brake capability (see 38 FR 13020). NHTSA did not deny the request on the grounds that the friction type requirement had any importance or relevance to the actual purpose of the parking brake requirement, roll-away prevention. In the preamble, NHTSA went on to say that if the friction type requirement appears design restrictive of other types of parking brake systems that would provide equivalent capability, they would be receptive to suggestions for substitute language with adequate supporting information. At the time (1973), NHTSA of course had no way of knowing that fifty years into the future there would exist technology (e.g., ESC) that can be activated by an electric parking brake control to provide emergency stopping capability via the parking brake control in an emergency situation. Of course, that technology, which uses friction type components of the service braking system, is commonly used on production vehicles today. For these reasons discussed above, we believe that the subsystem described here satisfies the portion of S5.2 which calls for the *parking brake system* to be of a friction type.

Separately, we believe that Porsche's next generation *parking brake system* described in Section 5 would satisfy the requirement that the *parking brake system* possess solely mechanical means to retain engagement. It would fulfill this portion of S5.2 by incorporating a positive lock (pawl). When tested in accordance with S7.12 of the FMVSS 135, the vehicle would be held stationary for more than 5 minutes.

6. Confirmation of our Interpretation of S5.2 is Requested

For the reasons discussed above, we request confirmation that you are in agreement with our assessment that a *parking brake system* as described in Section 5 would, by design, be capable of satisfying the requirement of S5.2 in FMVSS 135. We respectfully request that, in responding to our letter, you consider the complete history of the parking brake provision (going back to 1967) and carefully review our discussion of what was clearly a flawed opinion given by Mr. Seales in 1998. We ask that you independently consider the full history of the requirement and the reason why the original authors worded the parking brake **system** requirement as they did in 1967. When doing so, we are confident that you will concur with our views as set forth in this letter.

7. Closing

We appreciate your time and consideration of this matter and respectfully request your prompt consideration and resolution of this matter. Any questions that you may have regarding the content of this letter should be directed to Nick Tamborra at (248) 464-1836.

Sincerely,

Michael Scott

Director, Regulatory Affairs

CC: Dale Kardos, Kardos & Associates, LLC