February 18, 2020

SUBMITTED VIA REGULATIONS.GOV TO DOCKET# NHTSA-2019-0011
Jesus Valentin-Ruiz, Office of Crash Avoidance Standards
David Jasinski, Office of the Chief Counsel
National Highway Traffic Safety Administration (NHTSA)
U.S. Department of Transportation
1200 New Jersey Avenue SE
Washington, DC 20590

RE: Advance Notice of Proposed Rulemaking: Federal Motor Vehicle Safety Standards; Tires, 84 FR 69698, RIN 2127-AL96 (December 19, 2019).

Dear Mr. Valentin-Ruiz and Mr. Jasinski:

On behalf of the U.S. Tire Manufacturers Association (USTMA), I am pleased to submit this letter commenting on the above-captioned rulemaking. As the national trade association for tire manufacturers that produce tires in the U.S., USTMA has a direct interest in this rulemaking. USTMA members operate manufacturing facilities in 17 states, employ nearly 100,000 workers and generate annual sales of more than $27 billion. Our member companies include Bridgestone Americas; Continental Tire the Americas, LLC; Cooper Tire & Rubber Company; Giti Tire (USA) Ltd.; The Goodyear Tire & Rubber Company; Hankook Tire America Corp.; Kumho Tire U.S.A., Inc.; Michelin North America, Inc.; Nokian Tyres Inc.; Pirelli Tire LLC; Sumitomo Rubber Industries; Toyo Tire Holdings of Americas Inc. and Yokohama Tire Corporation.

USTMA supports NHTSA's effort to modernize the Federal Motor Vehicle Safety Standards (FMVSS) for pneumatic radial tires. ("Radial tire" and "modern tire" will be used for future references to "pneumatic radial tire." "Bias tire" or "bias ply tire" will be used for future references for "pneumatic bias ply tire"). Repealing obsolete tire testing standards and tire marking requirements will enhance the ability of tire manufacturers to develop and produce innovative new products with superior performance and reduce costs to tire manufacturers and the U.S. government without compromising tire safety. Even if NHTSA removes outdated regulations, NHTSA retains broad enforcement authority and discretion under the Highway Safety Act[1] to pursue products that pose a safety risk and initiate investigations and recalls in the interest of public safety.

USTMA supports repealing obsolete tests in FMVSS for bead unseating resistance (also referred to as "bead unseating") and plunger energy, eliminating parasitic tread block chunking as a failure mode in the FMVSS 139 endurance/low pressure test, repealing tire markings that are unnecessary for today's tires and updating tire markings, definitions and performance tests consistent with the Global Technical Regulation (GTR) for tires. USTMA supports the development of innovative tire technologies and asks that NHTSA develop only testing standards that are technology neutral, focus on tire performance and do not limit innovation.

I. NHTSA Should Repeal the Outdated Tests in FMVSS 139 for Bead Unseating and Plunger Energy, Since They Were Designed for Bias-Ply Tires and Do Not Enhance Tire Safety for Today's Radial Pneumatic Tires

USTMA asks that the FMVSS 139 bead unseating and plunger energy tests be eliminated, since they are outdated, obsolete test methods that do not provide a commensurate safety benefit for modern tires. USTMA has developed a comprehensive paper supporting these positions, which is included in this comment submission at Attachment A and incorporated here by reference. The tire testing standards

[1] Highway Safety Act of 1966 (P.L. 89-564, 80 Stat. 731) and subsequent amendments.

for bead unseating and plunger energy, first promulgated in 1967, were designed to assure the performance of tubeless bias ply tires when tubes were eliminated from use. These standards are obsolete and are not necessary to assure the performance of today's modern tires.

USTMA advocates that NHTSA eliminate the bead unseating test for all passenger and light truck (LT) radial tires subject to FMVSS 139, since it is an outdated test that was designed for bias ply tires. In August 2016, USTMA (then Rubber Manufacturers Association, or RMA) filed a Petition for Rulemaking with NHTSA to adopt the latest version of the ASTM International Standard Test Method for Beat Unseating of Tubeless Passenger and Light Truck Tires (ASTM F2663-15), which would accommodate modern tire sizes and aspect ratios. While this petition would address challenges with testing some tire sizes, it does not address the underlying issue that this test was designed to assess performance of bias ply tires.

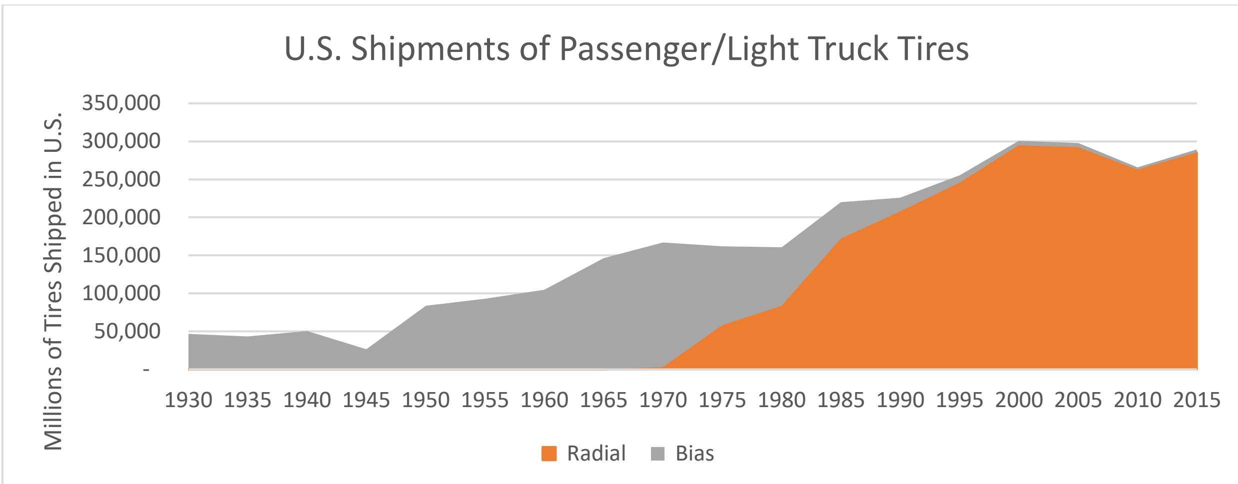
Interestingly, LT tires were not subject to bead unseating requirements until FMVSS 139 was implemented in 2007. Before that time, LT radial tires were not subject to bead unseat testing since they fell under FMVSS 119. LT tires easily pass due to their higher inflation pressures, making the bead unseating test meaningless and an unproductive use of testing resources for LT tires. Eliminating the bead unseating test would reduce costs for manufacturers to test products during product surveillance and development testing. It would also reduce costs to NHTSA to audit compliance. In addition, tires designed specifically to pass the test may contain additional material (with increased weight) at no benefit to the consumer and with an unintended consequence of increased rolling resistance, which contributes to lower vehicle fuel economy.

USTMA recommends that NHTSA repeal the plunger energy test for all passenger and LT radial tires subject to FMVSS 139. USTMA recommends that NHTSA retain the test for FMVSS 109, which includes bias ply tires. The plunger energy test remains appropriate for bias ply tires and the other specialty tires included in the applicability of FMVSS 109. In addition, USTMA recommends that NHTSA retain the plunger energy test in FMVSS 119 at this time. Additional evaluation of the FMVSS 119 plunger energy test could be included in the update to the FMVSS 119 requirements, should NHTSA decide to move forward with that rulemaking at a later date.

In addition, USTMA recommends that NHTSA expand applicability of FMVSS 139 to include load range F LT radial tires (up to 80 psi), since these tires can be used on vehicles of 10,000 pounds or less gross vehicle weight. Today, FMVSS 139 applicability only extends to LT sizes through load range E, so load range F tires (up to 80 psi) are subject to the older FMVSS 119 standards even though they are often installed in the same or similar vehicles as LT load range E tires. Extending FMVSS 139 applicability through LT load range F (up to 80 psi) would place comparable requirements on all tires that are installed on similar vehicles, thus assuring commensurate safety performance. So, LT load range F tires up to 80 psi, then would be subject to the more stringent FMVSS 139 high speed and endurance tests but not the plunger energy test, which would remain in FMVSS 119. Load range F tires with marking of 95 psi inflation pressure should remain in FMVSS 119.

In the past, USTMA petitioned NHTSA for rulemaking to update both tests (plunger energy, 2011, and bead unseating, 2016) to accommodate modern tire sizes and aspect ratios. While granting these petitions would address challenges with testing some tire sizes, it would not address the underlying fact that these tests were designed to assess the performance of bias ply tires.

Today, nearly all of the passenger and LT tires sold in the United States are radial tires. The graph below illustrates the shift to radial tires over time.



Designing radial tires to meet these outdated standards limits a tire manufacturer's ability to innovate using new materials and technology to improve tire performance and safety by requiring tire manufacturers to add additional material, including rubber and reinforcing material, which reduces radial tire performance in other areas such as tire weight, handling and rolling resistance. Additionally, designing radial tires to meet the bead unseating and plunger energy tests negatively impacts the environment due to the additional materials needed to produce each tire. We anticipate that tire performance would improve should these tests be eliminated, because tire manufacturers would have greater flexibility to utilize new technologies, including lighter weight materials.

USTMA does not support modifying or replacing either the bead unseating or plunger energy test. While as described above, USTMA has previously petitioned the agency to modify both tests to allow the tests to accommodate all modern tire sizes, these modifications would not address the more fundamental issue that these tests were designed for bias ply tires. In these comments, USTMA provides a rationale for eliminating each test. However, should NHTSA reject USTMA's recommendation to repeal the bead unseating and plunger energy tests in FMVSS 139 and move forward with a proposal to either modify or replace the tests instead, USTMA would offer additional comments during the NPRM stage of the rulemaking opposing those options.

II. NHTSA Should Eliminate Parasitic Tread Block Chunking as a Failure Mode in the FMVSS 139 Endurance/Low Pressure Test

USTMA also seeks reforms to the FMVSS 139 endurance/low pressure test that would eliminate unnecessary burdens on tire manufacturers. USTMA has developed a comprehensive paper supporting these positions, which is included in this comment submission at Attachment B and incorporated herein by reference. The FMVSS 139 endurance/low pressure test identifies tread chunking as a failure mode. RMA previously petitioned NHTSA to remove chunking as a failure mode in the FMVSS 139 endurance/low pressure test but NHTSA rejected RMA's recommendation "because we did not receive data demonstrating that some fixed percentage of a tire's tread could break away without detrimental effect on safe vehicle operation."[2] USTMA does not believe this demonstration is necessary because the type of tread block chunking that is a parasitic condition and which may result from this test (referred to as "PTBC" – parasitic tread block chunking – in future references) does not occur in the real world and is merely an artifact of testing a tire on a laboratory wheel.

Based on industry testing experience over the last fifteen years, USTMA has identified two kinds of tread chunking that occur during FMVSS 139 endurance/low pressure testing. One type is a parasitic condition that does not occur during field testing or in service and is due to portions of a tire's tread sticking to the test wheel and is an unintended result of the laboratory test itself. Since PTBC does not

[2] 71 Fed.Reg 877 (January 6, 2006) at 880.

occur in real world operating conditions, it should not be a criterion for determining whether a tire passes or fails the test. In contrast, tread chunking that exposes reinforcing material (e.g., nylon overlay or steel belts) *would* be an endurance concern and *should* be retained as a failure mode. Elimination of PTBC as a pass/fail criterion would also eliminate the need for testing tires marked with the Alpine symbol (i.e., 3PMSF) at a reduced speed of 110 km/h. Should NHTSA remove PTBC as a pass/fail criteria, all tires subject to FMVSS 139 could be tested at the same test speed of 120 km/h.

USTMA also is aware that other regions have recognized the challenges associated with PTBC. USTMA is aware that investigations are underway in China and Europe that may be instructive to NHTSA's evaluation of this phenomenon and recognizes that different potential solutions may offer both benefits and tradeoffs. For example, the Chinese Tyre & Rubber Quality Supervision and Inspection Center (CTQI) has acknowledged the presence of PTBC during endurance testing due to rubber sticking to the test wheel similar to the U.S. tire industry experience with FMVSS 139 endurance/low pressure testing and is investigating options to address it. USTMA will keep the Agency apprised of developments globally as they move forward.

III. NHTSA Should Eliminate Outdated and Unnecessary Tire Markings and Harmonize Tire Markings with the Global Technical Regulation for Tires

Several currently mandated tire markings are unnecessary for today's radial tires. These markings were designed in an era when bias tires and tube type tires were commonplace, and radial tires and tubeless tires were just beginning to enter the market. Today, nearly all tires sold in the United States are both pneumatic radial and tubeless tires. Federal regulations should streamline and minimize the regulatory burdens for pneumatic radial tires but continue to require legacy markings for atypical products, such as tube type tires, should they be sold in the United States. USTMA advocates that tire marking requirements be updated to reflect the modern tire market and to align with global harmonization efforts. USTMA has developed a comprehensive paper supporting these positions, which is included in this comment submission at Attachment C and incorporated herein by reference.

USTMA advocates that the following mandated tire markings should be eliminated without any safety concerns and to align with global harmonization efforts:

- Radial Construction FMVSS S5.5(h) – eliminate “Radial” marking
- Cord Material in the Plies FMVSS 139 S5.5(e) and Number of plies FMVSS S5.5(f)
- “TUBELESS” FMVSS S5.5(g) (retain the marking “TUBE TYPE” in the unlikely event a tube type tire is sold in the U.S.)
- UTQG Ratings – USTMA understands that UTQG is a not focus of this ANPRM, however USTMA continues to support repeal of UTQG requirements as described in its December 2017 comments.

In addition, USTMA advocates that NHTSA amend its markings consistent with the Tyre GTR:

- Service Description containing
    - Load Index
    - Speed Symbol
- Load Range markings (Tyre GTR Section 3.3.1.2.3.3.1)
- Markings for Dual/Single Fitments to Match FMVSS 119 S6.5 (d) for LT Tires
- Markings for EXTRA LOAD and LIGHT LOAD (Tyre GTR Section 3.3.6)
- Position of Markings

Tire manufacturers would benefit significantly from additional sidewall space being made available for future products, since tire sidewalls represent precious real estate as tire section heights and aspect ratios continue to shrink for new tire sizes. Other associated cost savings will include tire sidewall design time and resources to make sure all required markings fit and tire inspections to assure the required markings are included. Tire manufacturers would also benefit significantly by not being met with a potential non-compliance for inadvertently omitting one of the legacy tire markings currently required, as would NHTSA by not needing to review and process petitions for inconsequential noncompliance in these situations.

For existing products, however, tire companies would incur significant costs should they be required to remove repealed markings or add new markings to existing molds. For repealed markings, USTMA recommends that NHTSA eliminate the marking requirement but continue to allow the marking as a voluntary marking to reduce any potential burden to tire manufacturers for existing molds. If these markings would be required to be removed from existing products, tire manufacturers would incur costs associated with taking molds out of service, welding, engraving and manpower, among others.

Recognizing that adding new marking requirements may potentially pose added costs to some tire manufacturers, USTMA advocates that NHTSA adopt a phase-in period for any marking changes to reduce any burdens on tire manufacturers, consistent with NHTSA's phased-in implementation approach to the Tire Identification Number. In that rule, NHTSA recognized that a transition period of ten years would eliminate nearly all additional costs associated with a tire marking transition. Similarly, the Tyre GTR technical justification and rational recognizes that "when adopting the provisions of UN GTR No. 16, it is recommended that countries are given a transition period of up to ten years to minimize costs associated with regulatory changes that require different tyre markings." USTMA also recognizes that since load index and speed symbol are commonly included on tire sidewalls today, implementation costs and other associated burdens would be minimized.

IV. Additional Technical Changes Recommended Consistent with the Tyre GTR, Developments of Tire Standards Organizations and Tire Technology Trends

USTMA would like to recommend several additional changes consistent with the Tyre GTR, including definitions changes and adoption of the high speed test, which would incorporate speed ratings into U.S. regulations. USTMA plans to submit a technical supplement to these comments that will provide these and other additional recommendations in the coming weeks.

V. NHTSA Should Adopt Technology-Neutral Regulations to Foster Innovation

USTMA members embrace the opportunity to develop new, innovative technologies to enhance tire and vehicle safety, performance and reliability. USTMA advocates that NHTSA consider potential disparate impacts on new and existing tire technologies as it develops new regulations or updates existing ones and focus its regulatory efforts on performance, rather than specific technologies. Today, with rapidly evolving technology in the era of autonomous and connected vehicle innovation, once settled technologies are being challenged, enhanced and replaced. Regulations that once would have been considered technology neutral are now viewed as technology limiting. Yet, this trend is not new.

The Uniform Tire Quality Grading (UTQG) standards provide a relevant case study to illustrate this challenge. When the UTQG standards were developed in the late 1970’s, the wet traction testing requirements likely would not have been considered to be technology limiting. It set performance-based ratings based on an objective test. However, as tire technology advanced, yielding better wet traction performance, the rating categories required adjustment, and a new higher performing “AA” category was created. Again, the system seemed to be performance-based and not technology limiting. Then another innovation entered the scene, this time a vehicle innovation. Antilock brakes changed the game entirely.

Antilock braking prevents a vehicle's brakes from locking up, so the "slide" based tire wet traction measurement upon which the UTQG wet traction rating is based became irrelevant. Instead, with antilock braking now the accepted vehicle braking technology, tire wet traction now is most appropriately measured by the "peak" coefficient of friction. Still, the UTQG wet traction test remains based on the "slide" coefficient of friction, which causes tire manufacturers to design tires to an obsolete test that does not mimic the tire performance demanded by modern vehicles. Again, the UTQG wet traction test is technology limiting. NHTSA has recognized that migrating to the wet traction test measuring "peak" coefficient of friction is necessary and has conducted significant testing in preparation for moving to that test, consistent with other global tire regulations.

So how can NHTSA avoid this situation in the future? Perhaps it is unavoidable that the emergence of a new, innovative technology will at times render an existing regulation technology limiting, since regulations are by necessity created through the lens of current technology. Then what can be done? NHTSA can specifically describe the product covered by a regulation, so that as new products are developed, it is clear to which products an existing regulation does and does not apply, should a product be outside the existing definition. NHTSA should focus its regulation on objective performance criteria, rather than the capabilities of a narrow set of technologies, in order to allow for enhanced future performance such as in the situation where a new wet traction grading category needed to be added to reflect new, higher performing tires. Finally, but perhaps most importantly, NHTSA should review its regulations periodically to assure that they have not become technology limiting as technology advances, creating both new and higher performing products. This kind of periodic and systematic review of existing regulations has precedent in DOT regulations and regulations in other agencies.

Again, we appreciate that the Agency has published this advanced notice of proposed rulemaking. We applaud the Administration's efforts to reform outdated, unnecessary regulations and look forward to working with the Agency as this rulemaking proceeds. We will continue to provide NHTSA with additional information in support of this rulemaking as we develop new data and analyses. Thank you for the opportunity to provide these comments. Should you have any questions or require further information, please contact me at 202-682-4839 or tnorberg@ustires.org.

Sincerely,

Tracey Norberg
Senior Vice President & General Counsel
U.S. Tire Manufacturers Association

Attachments:
(1) Attachment A: FMVSS No. 139 Bead Unseating Test and Plunger Energy Test Should be Repealed
(2) Attachment B: Parasitic Tread Block Chunking Should be Removed as a Failure Mode in FMVSS No. 139 Endurance/Low Pressure Test
(3) Attachment C: NTHSA Should Modernize Tire Markings in FMVSS No. 139

ATTACHMENT A

BEAD UNSEATING TEST AND PLUNGER ENERGY TEST

IN FEDERAL MOTOR VEHICLE SAFETY STANDARD (FMVSS) No. 139

SHOULD BE REPEALED

I. Introduction

USTMA asks that Federal Motor Vehicle Safety Standard No. 139 ("FMVSS 139")[1] bead unseating and plunger energy tests be eliminated, since they are outdated, obsolete test methods that do not provide a commensurate safety benefit for modern pneumatic radial tires. ("Radial tire" and "modern tire" will be used for future references to "pneumatic radial tire." "Bias tire" or "bias ply tire" will be used for future references for "pneumatic bias ply tire"). These tests were first promulgated in 1967 to evaluate bias tires when tubes were eliminated from use and were based on from the 1965 version of SAE J918 - "Passenger Car Tire Performance Requirements and Test Procedures." Field performance of tires in countries with no tire bead unseating or strength performance tests requirement show no related performance issues with tires in service.

In the past, USTMA petitioned NHTSA for rulemaking to update both tests (plunger energy, 2011 and bead unseating, 2016) to accommodate modern tire sizes and aspect ratios. While these petitions would address challenges with testing some tire sizes, they would not address the underlying concern that these tests were designed to assess the of bias ply tires.

Eliminating these tests would reduce costs for manufacturers to test products during product surveillance and development testing and would also reduce costs to NHTSA to audit compliance without negatively impacting tire performance. In addition, tires designed specifically to pass these tests

[1] 49 CFR § 571.139 - Standard No. 139; New pneumatic radial tires for light vehicles.

may contain additional material (with increased weight) at no benefit to the consumer and with an unintended consequence of increased rolling resistance, which contributes to lower vehicle fuel economy.

As NHTSA aptly stated in its 2002 Notice of Proposed Rulemaking for FMVSS 139 and reiterated in a 2013 technical paper studying the plunger energy test method,[2]

> The FMVSS NO. 109 plunger energy or strength test was designed to evaluate the strength of the reinforcing materials in bias-ply tires, typically rayon, nylon or polyester, and it continues to serve a purpose for these tires. However, a radial tire is not susceptible to the kind of failure for which this test was designed to prevent. The flexible sidewalls of radial tires easily absorb the shock of road irregularities.
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> Because of the belt package, radial tires far exceed the strength requirements of the test and many times the plunger bottoms-out on the rim instead of breaking the reinforcing materials in the radial tire. During the years 1996 through 1998 RMA members reported conducting nearly 19,000 plunger energy (strength) tests on radial tires. There were no reported failures.[3]

Similar observations were made in the 2006 book entitled *The Pneumatic Tire*,[4] commissioned by NHTSA, which stated that

> generally, radial passenger car tires contain a minimum of three plies in the tread region (two belt plies and at least one radial body ply) and rarely fail to achieve the minimum value of plunger energy necessary to meet the test requirements. This test is especially moot for steel belted tires featuring nylon cap or overlay plies added to the belt region to achieve high speed ratings. Also, very low-aspect-ratio tires tend to limit plunger travel which can cause the tire tread region to come in contact with the rim (i.e., "bottom-out") before the requisite level of calculated energy is achieved unless plunger

[2] Harris, J. R., Larry R. Evans, L. R., & MacIsaac Jr., J. D. (2013, July). Evaluation of laboratory tire tread and sidewall strength plunger energy test methods. (Report No. DOT HS 811 797). Washington, DC: National Highway Traffic Safety Administration.

[3] 67 Fed.Reg. 10049 (March 5, 2002).

[4] Gent, A. N., & Walter, J. D. (Eds.). (2006, February). The pneumatic tire. (Report No. DOT HS 850 561). Washington DC: National Highway Traffic Safety Administration. Available at www.nhtsa.gov/staticfiles/safercar/pdf/PneumaticTire_HS-810-561.pdf.

force is allowed to build up against the rigid surface of the rim without further plunger travel.

II. Background

The DOT bead unseating test and strength test (commonly referred to as the “plunger energy” test) originally contained in FMVSS 109 was adapted from the SAE Recommended Practice J918b – Passenger Car Tire Performance Requirements and Test Procedures (January 1967). The bead unseating portion of the SAE J918b was developed and introduced circa 1960 due to the concern that a new generation of tubeless tires would be more prone to bead unseating than the previous tube-type tires.

The bead unseating laboratory test is conducted on a special machine to press a specified block against the tire sidewall while recording the force required to unseat the bead. The tire has a specified inflation pressure (26 psi for a Standard Load tire), which was typical of the placard inflation pressures in that era. The block is pushed into the tire at a rate of 2 inches per minute. The tire is static, i.e. no rotation. The plunger energy test is also conducted on a static laboratory machine where the specified plunger is pressed into the centerline of the tread at a rate of 2 inches per minute. The regulatory requirement for the plunger energy test is a minimum energy level, hence both force and penetration distance are recorded and used to calculate the energy level.

Today’s highway tires are nearly exclusively radial tires. Also, since that time tire sizes have changed dramatically. When FMVSS 109 was promulgated, most light vehicle tires had aspect ratios of 78 to 85 percent and had rim sizes of 14- to 15-inch diameter. Now, tire aspect ratios are much lower, with aspect ratios as small as 20- and up to 25-inch rim diameters. The bead unseating test cannot perform as intended for all modern tire sizes and does not meet its original objective, since passenger and light truck tires have almost completely been converted to radial technology. Although there have been several revisions to Federal Motor Vehicle Safety Standard No. 139 ("FMVSS 109")[5] to accommodate tires with larger bead diameters, the current regulation does not properly address the range of tire sizes in the market today. NHTSA evaluated the challenges associated with conducting the bead unseating test in its 2013 report entitled "Laboratory Tire Bead Unseating – Evaluation of New Equipment, Pressures and "A" Dimension from ASTM F-2663-07" (DOT HS 811 735). ASTM also developed an updated test method to address the wide range of tire sizes in the market today (ASTM F2663-15).

After the passage of the National Traffic and Motor Vehicle Safety Act of 1966, radial pneumatic tires were gradually introduced in the market replacing bias as well as bias belted tires. Original Equipment Manufacturers (OEM) passenger car tire evolution to radial tires was nearly 100 percent by 1978. Even after radial tires became the preferred tire construction for passenger cars, NHTSA still required compliance to bead unseating and plunger energy tests. In 2000, Congress enacted the Transportation Recall Enhancement, Accountability and Documentation Act ("TREAD Act"), and NHTSA developed FMVSS 139, which applies only to radial tires. In the development of FMVSS 139, as noted above, NHTSA recognized that "a radial tire is not susceptible to the kind of failure for which [the plunger energy] test was designed to prevent."[6] In fact, in its 2002 proposed rule, NHTSA gives a detailed description of radial tire construction then concludes that "these characteristics of a radial tire construction are what make the existing … [plunger energy] and bead-unseating test appear to be ineffective in differentiating among today's radial …."[7] In its proposed rule, NHTSA proposed a different test to evaluate tire strength, yet did not demonstrate any safety problem that this new proposed test would be addressing, so the new test was appropriately abandoned in the final rule.[8] Therefore, the

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[5] 49 CFR § 571.109 - Standard No. 109; New pneumatic and certain specialty tires.
[6] 67 Fed.Reg. 10049 (March 5, 2002).
[7] *Id.* at 10054.
[8] 68 Fed.Reg. 38115 (June 26, 2003).

agency continued to require compliance with the bead unseating test and plunger energy test for modern radial tires. In fact, NHTSA replicated the FMVSS 109 bead unseat and plunger energy tests (also in FMVSS 119) into the new FMVSS 139 for radial passenger and light truck tires (for use on vehicles up to 10,000 pounds gross vehicle weight).

III. U.S. Tire Market

Since the 1960's, the U.S. tire market has shifted from a mix of bias ply and radial tires to nearly 100 percent radial tires. Data collected by USTMA and its predecessor, the Rubber Manufacturers Association, indicate that in 2018, about 98.8 percent of passenger and light truck tires shipped in the U.S. were radial tires. Of the 1.2 percent of bias ply tires remaining in the U.S. market in 2018, the vast majority of those tires were T-type temporary spare tires, which are not subject to FMVSS 139. In 1929, all tires shipped into the U.S. market were bias/bias ply tires, whereas in nearly all of the tires in the U.S. market were radial construction. See Appendix 2 for a table of passenger/light truck shipments in the U.S. from 1929 through 2018.

Similarly, truck/bus tires are nearly all radial today in the U.S. market. USTMA has data going back to 1983, which shows that 46 percent of U.S. truck/bus tire shipments were radial tires. In 2018, about 98.8 percent of all truck/bus tires were radial tires. Appendix 3 contains U.S. tire shipment data for truck/bus tires from 1983 – 2018.

IV. USTMA Recommendations

a. Bead Unseating Test

USTMA advocates that NHTSA eliminate the bead unseating test for all passenger and light truck (LT) radial tires subject to FMVSS 139, since it is an outdated test that was designed for bias ply tires. In

August 2016, USTMA (then Rubber Manufacturers Association, or RMA) filed a Petition for Rulemaking with NHTSA to adopt the latest version of the ASTM International Standard Test Method for Beat Unseating of Tubeless Passenger and Light Truck Tires (ASTM F2663-15), which would accommodate modern tire sizes and aspect ratios. While this petition would address challenges with testing some tire sizes, it does not address the underlying issue that this test was designed to assess performance of bias ply tires.

Interestingly, LT tires were not subject to bead unseating requirements until FMVSS 139 was implemented in 2007. Before that time, LT radial tires were not subject to bead unseat testing since they fell under FMVSS 119. LT tires easily pass due to their higher inflation pressures, making the bead unseating test meaningless and an unproductive use of testing resources for LT tires. Eliminating the bead unseating test would reduce costs for manufacturers to test products during product surveillance and development testing. It would also reduce costs to NHTSA to audit compliance. In addition, tires designed specifically to pass the test may contain additional material (with increased weight) at no benefit to the consumer and with an unintended consequence of increased rolling resistance, which contributes to lower vehicle fuel economy.

b. Plunger Energy Test

USTMA recommends that NHTSA repeal the plunger energy test for all passenger and light truck radial tires subject to FMVSS 139 and retain the test for FMVSS 109, which includes bias ply tires. The plunger energy test remains appropriate for bias ply tires and the other specialty tires included in the applicability of FMVSS 109. In addition, USTMA recommends that NHTSA retain the plunger energy test in FMVSS 119 at this time. Additional evaluation of the FMVSS 119 plunger energy test could be included in the update to the FMVSS 119 requirements, should NHTSA decide to move forward with that rulemaking at a later date.

In addition, USTMA recommends that NHTSA expand applicability of FMVSS 139 to include load range F radial tires up to 80 psi, since these tires can be used on vehicles of 10,000 pounds or less gross vehicle weight rating (GVWR). Today, FMVSS 139 applicability only extends through load range E, so load range F tires (up to 80 psi) are subject to the older FMVSS 119 requirements even though they are often installed in the same or similar vehicles as load range E tires. Extending FMVSS 139 applicability through load range F up to 80 psi would place comparable requirements on all tires that are installed on similar vehicles, thus equaling the playing field. So, load range F tires, would then be subject to the more stringent FMVSS 139 high speed and endurance tests but not the plunger energy test, which would remain in FMVSS 119.

The tire plunger energy test employs a steel plunger, with a rounded end, that is used to contact the tire/wheel mounted assembly at the tire tread centerline and then slowly advance into the tire until a certain force (energy level) is reached, or the tire is punctured. However, with increasingly popular, low aspect ratio radial passenger tires, the plunger “bottoms out” on the wheel well before reaching the required force to pass the existing plunger energy test. In response to this situation, the industry has developed deep well rims, which allow the test to be conducted on more tire sizes, even though the deep well test rims are not representative of real-world conditions that a tire will encounter. Even when specially fabricated deep well rims are used, the plunger will still at times bottom out before the minimum required force is achieved, which requires redesign and fabrication of a new, even deeper, well design. The various deep well rim designs add more cost and complexity to compliance testing, while trying to fit an outmoded test to modern tires.

In addition, tires are sometimes redesigned (or over-designed) beyond what is necessary for good performance in all other areas in order to pass this antiquated test, adding costs to manufacturers without a commensurate safety benefit. In 2011, USTMA (then RMA) petitioned NHTSA for rulemaking to address this problem in FMVSS 109 and 139. USTMA recommended that NHTSA adopt ASTM International test procedure F414-15 "Standard Test Method for Energy Absorbed by a Tire When Deformed by Slow-Moving Plunger". This test procedure provides a solution to this problem in paragraph 9.7, which provides, "if the tire fails to break before plunger is stopped on reaching the rim…then the required minimum breaking energy is deemed to have been achieved at that point." USTMA recommended that NHTSA revise the existing tire plunger energy test requirements to include this provision, and eliminate the need for deep-well rims which are not standard and not representative of real-world needs.

While acting on this petition would solve the immediate testing challenges, it would not address the underlying fact that the plunger energy test was designed for bias ply tires and does not protect against product performance issues in modern radial tires. Eliminating this test requirement would reduce the regulatory burden on tire manufacturers without impacting tire safety or performance. Many other global regions do not mandate a plunger energy test and do not experience related performance issues in the field. Likewise, eliminating the plunger energy test would eliminate costs to NHTSA associated with auditing for compliance.

c. USTMA Position on Modifying or Replacing Either Test

USTMA does not support modifying or replacing either the bead unseating or plunger energy test. While as described above, USTMA has previously petitioned the agency to modify both tests to allow the tests to accommodate all modern tire sizes, these modifications would not address the more fundamental issue that these tests were designed for bias ply tires. In these comments, USTMA provides a rationale for eliminating each test. However, should NHTSA reject USTMA's recommendation to repeal the bead unseating and plunger energy tests in FMVSS 139 and move forward with a proposal to either modify or replace the tests instead, USTMA would offer additional comments during the NPRM stage of the rulemaking opposing those options.

V. Rationale for Repealing the Bead Unseating and Plunger energy Tests

From an engineering mechanics perspective, there is a well-established difference in functional behavior between bias ply and radial ply tires. The advent of the radial tire for the general public had numerous obvious benefits including improved vehicle handling, particularly steering response; tracking, i.e., the ability to maintain the desired direction without the tire following uneven ridges or shoulder 'drop offs' at the edge of the roadway; significantly extended tread life; and greater resistance to tire disablement from impact damage. A less obvious advantage at that time was the improvement to fuel economy, a direct effect of the reduced rolling resistance of a radial ply tire compared to a comparable bias ply tire.

Dr. Joseph Walter, Ph.D., retired professor of mechanical engineering at the University of Akron, authored a short paper that discusses the differences between bias ply and radial tires, particularly in relation to the bead unseating and plunger energy tests. In his paper, Dr. Walter discusses the differences in construction between bias ply and radial tires and shows the different components of each. He then comments on both the bead unseating test and the plunger energy test as applied to today's tires. He concludes that "due to the present and trending state of tire technology and related requirements," the bead unseating and plunger energy tests "are not valid predictors of tire safety" and they should be removed from the FMVSS for radial tires. Dr. Walter's complete paper is included in this document at Appendix 1. Dr. Walter is anticipated to develop a more comprehensive paper on the topic, which will be available later this spring and will be provided to NTHSA at that time.

a. Tire Mechanics Rationale Supporting Repeal of Bead Unseating Test

Many of the attributes of radial tires are due to the inherent effect of having the tire sidewall 'decoupled' from the tread. Whereas the bias ply tires behaved more as a rigid structure, the radial ply tire offered the ability for the high modulus tread to have greater continuous contact with the roadway, while the sidewalls (casing) would flex independently from the tread band. This decoupling effect between sidewall and tread band is also why the bead unseating test is not appropriate for radial ply tires.

To illustrate this effect, consider a tire mounting machine, and more specifically the demounting procedure. When demounting a tire, a curved block is positioned just above the rim flange and pushed against the sidewall to force the bead away from the rim flange. The two significant differences between demounting a tire from the wheel and the bead unseating test are:

1. In the bead unseating test, the tire is still inflated; therefore, having a high pneumatic stiffness. When demounting a tire from the rim, the valve core is removed so there is zero inflation pressure.
2. The bead unseating test positions the block (slightly different shape and contour), at a specified distance farther away from the rim flange than the block of a tire mounting machine.

The concept of dismounting a tire is to force the bead away from the flange, by pressing as close to the bead as possible. The concept of a tire becoming unseated (debeading) while on the road is entirely different. Barring any direct lateral impact, such as sliding laterally into a curb for example, the forces to possibly 'debead' a tire would come entirely from lateral forces generated between the tread and the road surface. When lateral forces are generated at the tread surface, these forces are transmitted through the tire sidewall (casing) to the bead area. Due to the decoupling phenomena between the tread and sidewall of radial tires, the force is not transmitted to the bead in the same manner as in a bias ply tire. The compliance (additional flexibility) of the radial tire sidewall and resultant distribution of forces makes the radial tire inherently less susceptible to debeading than bias ply tires. This phenomenon was well understood in Europe where radial ply tires were introduced much earlier than in the US. European regulations, UN Regulation No. 30 for passenger car tyres, or Regulation No. 54 for commercial tyres (including light truck) never required the bead unseating (or plunger energy) test. The countries that have adopted the UN regulations (not only Europe, but Japan, Russia, Turkey, South Africa) have no issues with tire debeading. The continued regulatory requirement for the bead unseating test for radial passenger and light truck tires is not justified.

b. Tire Mechanics Rationale Supporting Repeal of Plunger Energy Test

The tire plunger energy test as required for passenger car tires (as well as light truck tires in FMVSS 139, referring to the minimum requirements as published in FMVSS 119) was also adopted from SAE J918b. Again, this test was "designed to evaluate the plunger energy of the reinforcing materials in bias ply tires, typically rayon, nylon, or polyester, and it continues to serve a purpose for these tires."[9] Further, as detailed in the Supplemental Notice of Proposed Rulemaking (SNPRM) on updates to FMVSS 119, NHTSA described that "the breaking energy requirements … were higher for nylon and polyester cord tires than for rayon cord tires in order to ensure that the plunger energy test stringency was

[9] 78 Fed.Reg. 2237 (January 10, 2013).

comparable for different tire cord materials."[10] In other words, the plunger energy requirements were tailored to the materials that were used in the tires.

As mentioned under the discussion of the bead unseating test, the radial tires have a significantly different structure than the bias ply tires they have replaced. The radial tires have a high modulus tread construction, comprised of at least two plies of opposing angle steel cords to create the belt. This structure creates a tread band stiffness several fold more than stiffness of a bias tire. Therefore, the tread region of a radial ply tire is much more resistant to impact damage, whether from the plunger in a laboratory test or on the roadway. The bias tire construction is more susceptible to rupture of the plies in the crown area of the tire.

The reported issues of radial tire disablement, particularly for low profile radial tires, is a totally different phenomenon than the plunger energy requirement as determined from the plunger test methodology. Reported low profile tire disablements, often caused by striking major anomalies such as deep pot holes, also result in wheel and possible suspension damage. This results in the significant misconception that a stronger tire would eliminate this damage disablement.[11] Although there are many reports of such disablement, there is no consistent, reliable reporting protocol that documents when there is also wheel damage. These tire/wheel disablements have no correlation to the plunger energy test requirements.

[10] *Id.*
[11] *See generally,* 84 Fed.Reg. 69698, 69801 (December 19 2019).

c. USTMA Testing of Imported Tires

Periodically, USTMA conducts surveillance testing of tires subject to FMVSS 139 to assess compliance with the endurance and low pressure tests at an independent test laboratory. During USTMA's most recent test campaign, seventeen tire make/model size combinations had at least one sample that did not complete the FMVSS 139 endurance and low pressure tests. Of those seventeen tires, USTMA was able to locate and procure additional samples of eleven. USTMA conducted bead unseating and plunger energy tests on these eleven brand/models of the tires tested, one was a passenger Standard Load tire, one was an LT Load Range D tire and nine were LT Load Range E Tires. During the FMVSS 139 endurance/low pressure test, five of the tires made 38 hours, but failed inspection, three tires failed between 30 and 37 hours, three tires failed between 20 and 29 hours and one tire failed between 10 and 19 hours. This study demonstrated that compliance with either the bead unseating or plunger energy tests is not a good predictor of acceptable tire performance. Instead, the FMVSS 139 endurance/low pressure test is a better discriminator to identify tires with substandard performance. USTMA encourages NHTSA to conduct this type of analysis with its own data that the Agency generates during its annual compliance surveillance audits to demonstrate that FVMSS 139 the endurance/low pressure test identifies tires with performance problems, whereas the bead unseating and plunger energy tests do not. The complete data set for this testing is included at Appendix 4.

Summary of the bead unseating results for the 11 tires:

- Average results were 162% greater than the DOT minimum. 6,560 lbf. versus 2,500 lbf. min.
- Highest result was 227% greater than the DOT minimum. 8,166 lbf. versus 2,500 lbf. min.
- Lowest result was 36% greater than the DOT minimum. 3,412 lbf. versus 2,500 lbf. min.

These brands/sizes showed a tendency to have non-compliances on the FMVSS 139 endurance/low pressure test, but on average, easily exceeded the minimum bead unseating by 162%.

Summary of the plunger energy results for the 11 tires:

- Average results were 53% greater than the DOT minimum.
- Highest result was 250% greater than the DOT minimum. 9,100 in-lbs. versus 2,600 in-lbs.
- Lowest result was 3% greater than the DOT minimum. 5,236 in-lbs. versus 5,100 in-lbs.
- Passenger, Std. Load – was 250% greater than DOT minimum. 9,100 in-lbs. versus 2,600 in-lbs.
- LT, LR D – was 42% greater than DOT minimum. 6,455 in-lbs. versus 4,550 in-lbs.
- LT, LR E – averaged 32% greater than DOT minimum. 6,754 in-lbs. versus 5,100 in-lbs.

These brands/sizes showed a tendency to have non-compliances on the FMVSS 139 Endurance/Low Pressure test, but on average, easily exceeded the minimum plunger energy by 53%.

VI. Compliance with Bead Unseating and Plunger Energy Tests Has Negative Consequences to Tire Performance, Innovation and Cost

Designing tires to meet the outdated bead unseating and plunger energy tests limits tire manufacturers' ability to produce innovative, high performing tires that are optimized for other highly sought-after traits. For example, larger steel cables in the tread area require the use of more rubber to encapsulate the larger cables. This additional rubber mass increases rolling resistance, which lowers the vehicle's fuel economy. As well, the stiffer cables increase the tread stiffness, which negatively affects the tire's ride and reduces tire comfort. Negative impacts can include reduced tire performance in other areas, higher materials costs associated with designing tires to contain additional and/or heavier gauge material, limiting use to new, innovative materials that would improve tire performance and lengthening tire design cycles to develop a tire around compliance with these tests (especially for new or difficult tire sizes). These factors result in lost opportunity costs, higher material costs and delays in bringing new products to market, which together limit the competitiveness of U.S. tire manufacturers relative to other tire markets.

In the case of bead unseating, this test also often demands the use of more and heavier materials, since the requirements are based on bias ply tires. As with designing a tire to meet plunger energy testing requirements, these added materials are typically only necessary to assure compliance with the bead unseating test and do not enhance tire performance or safety. Designing tires to meet the bead unseating test can also have unintended consequences that affect tire installation and service. Tires that are excessively "tight" on the rim may not mount or seat correctly, leading to tire/wheel assembly non-uniformity. This can lead to undesirable vibrations in the rolling tire. Tires that are excessively "tight" on the rim are at more risk of damage while mounting, which could lead to early tire failure if the damage is internal to the tire and not visible.

Designing tires to meet the plunger energy test further limits a tire's performance in other critical areas. For both original equipment (OE) and replacement market tires, the belt package of extra load (XL) tires (especially XL run-flat tires) must sometimes be over-designed to pass this test. This adds unnecessary cost to the tire and adds mass to the tire which impacts vehicle fuel economy and comfort/handling. OE customers (vehicle manufacturers) demand tires that are light weight and have low rolling resistance and some require extended mobility or run-flat tires. Achieving these OE customer demands has been impeded by the need to meet plunger energy requirements:

- Lighter Weight Tires – designing to meet the plunger energy test can drive higher levels of carcass and/or belt reinforcement components that provide no other performance benefits, at the cost of weight.
- Rolling Resistance – designing to meet the plunger energy test can require additional carcass and/or belt reinforcement, causing negative impact on rolling resistance due to increased tire weight. All other performance characteristics of the tire, including tire durability, can be met with less reinforcements.
- Extended Mobility/Run-flat Tires – designing to meet the plunger energy test can require the resulting structure needed for an extremely reinforced sidewall construction to limit a tire manufacturer's ability to meet required weight and rolling resistance requirements.

Designing tires to meet the outdated plunger energy test limits a tire manufacturer's ability to innovate using new materials and technology to improve tire performance and safety. For example, in some cases, new tread ply steel cables cannot be deployed because tires containing them do not meet the plunger energy test requirements. These new technologies would bring mass reduction and therefore benefits to fuel economy. Development results from other testing (both laboratory and field) show that these cables offer sufficient strength to assure tire performance in the field and protect the consumer.

In addition to negative consequences associated with additional costs and limitations to tire performance and innovation, designing tires to meet the bead unseating and plunger energy tests negatively impacts the environment. Due to the additional steel and rubber added to tires to comply with the bead unseating and plunger energy tests, additional resources are needed to produce each tire. This added rubber and steel, as well as the thousands of test tires that are scrapped each year, increases the load placed on the environment when a tire is scrapped at the end of its useful life. In fact, we anticipate that tire performance would improve should these tests be eliminated, because tire manufacturers would have greater flexibility to utilize new technologies and lighter weight materials.

USTMA has evaluated the costs associated with complying with the bead unseating and plunger energy tests. The annual costs associated with conducting the actual tests are straightforward to calculate by determining the number of tests conducted by a tire manufacturer in a typical calendar year, estimating the average cost to conduct each test on a per tire basis and estimating the average costs to produce and procure each test tire. However, these costs underestimate the true burden of compliance with these tests. As described above, the opportunity costs associated with compliance are significant and include raw materials costs, limits on innovation and negative impacts on other tire performances. Estimating these other costs is challenging and involves intensive investigation and analysis.

Appendix 1

Tire Plunger and Bead Unseat Observations

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Abstract: Plunger and bead unseat tests contained in FMVSS 109 are not valid predictors of tire safety.

I. Introduction

FMVSS 109 was issued in 1968 and prescribed minimum tire performance requirements for speed, endurance, plunger energy and bead unseating. At that time, bias ply tires were the norm for North American motorists. Passenger car tires featured aspect ratios of 78 to 85 percent and had rim diameters of 14 inches or 15 inches and operated at a recommended pressure of 24 psi. SUVs and light trucks, popular today, were not yet a factor in the automotive market.

By the mid-1970s, OEM and replacement radial tire fitments were underway in the US and became available to the average motorist. During the oil shocks of the mid- to late-1970s, tire inflation pressures were boosted to 32-36 psi as a means of reducing rolling resistance without significantly modifying existing tire lines. During the 1980s, plus-sizing tire-wheel assemblies entered the picture as a fashion statement; rim sizes with corresponding wheel diameters slowly migrated to today's norm of 17 to 20 inches with aspect ratios now mostly in the range of 35 to 60 percent.

By the late 1990s, runflat tires with thick, stiff sidewalls entered the scene on up-market, mainly, BMW automobiles. On some of today's newest vehicles, plus-sizing continues unabated; wheel diameters have correspondingly increased to 22 inches.

Finally, with the implementation of FMVSS 138 (2005-2007), requiring tire pressure monitoring systems (TPMS) on all new cars, SUVs and light trucks, the consumer is now much less likely to drive on underinflated tires. All of these long-term tire trends have significantly improved tire performance, while also inadvertently rendering the FMVSS 109 plunger and bead unseat tests obsolete and unnecessary.

II. Bias-ply Tire Construction (from TRB Special Report 286, 2006)

"A pneumatic tire in which the ply cords that extend to the beads are laid at alternate angles substantially less than 90 degrees to the centerline of the tread. The bias-ply tire was the predominant passenger tire in the United States before 1980 but is no longer in common use; it has been supplanted by the radial-ply tire." [1] Schematic views of bias and radial tires are shown in Figure 1.

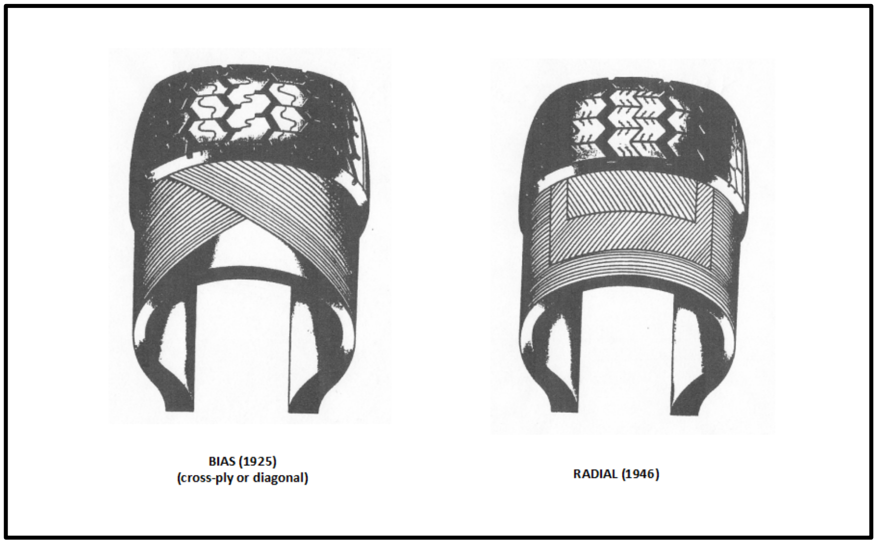

Figure 1. Schematic views of bias and radial tire construction

III. RADIAL-PLY TIRE CONSTRUCTION ([i]FROM TRB SPECIAL REPORT 286, 2006)

"A pneumatic tire construction under which the ply cords that extend to the beads are laid at approximately 90 degrees to the centerline of the tread. Two or more plies of reinforced belts are applied, encircling the tire under the tread. Radial-ply tires were introduced in Europe during the 1950s and came into common use in the United States during the 1970s."[2]

A detailed view of a section of a radial passenger car tire (PCR) is shown in Figure 2.

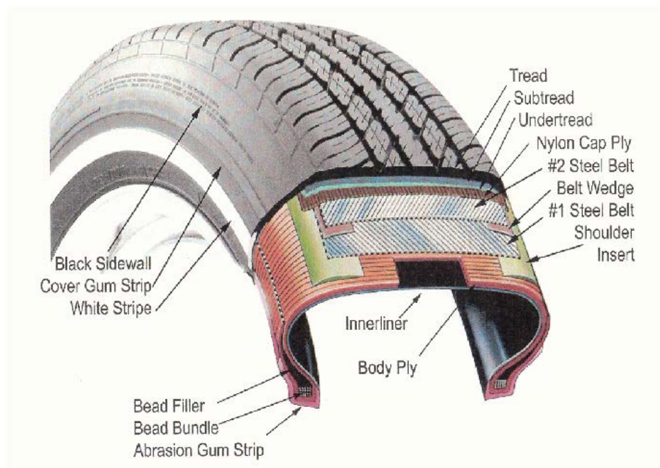

Figure 2. Passenger Car Radial Tire Components Principal Parts: Tread, Sidewall, Bead, Carcass and Belt

IV. PLUNGER TEST COMMENTS RELEVANT TO TODAY'S TIRES

Consider the mechanical properties (viz., strength and stiffness) in the tread region (or crown) of the triangulated plies of the radial tire belt and its relevance to the plunger test compared to the pantographing plies of a comparably sized bias ply tire. It is these mechanical properties, along with tire geometry and inflation pressure, that determine tire response to load inputs, whether from highway service or due to lab tests such as the plunger. Specifically, tread region strength and stiffness of either construction is largely determined by the moduli and cross-sectional areas of the constituent cord-rubber components. While these properties can be calculated from principles of composite material mechanics, it is useful to infer these properties from experimental test results.

Consider that the innocuous body ply material, whether polyester or rayon, under the steel belt of today's radial tire forms an array of stabilizing triangles that reinforces the tread region. This process, known as triangulation, is well-known to civil engineers and was recognized as such in the early radial tire patents of Michelin. These undeforming triangles impart a many-fold strength and stiffness increase to an otherwise compliant structure. Absent the underlying body ply, these belt cords, whether steel or textile, would pantograph as an assembly of non-rigid rhombuses, and such tires would behave as their bias ply counterparts.

Pantographing in bias ply tires is also known as "scissoring" due to the measurable cord angle changes that repeatedly occur under cord loading and unloading with each revolution of the tire. These angle changes induce large shear strains in the rubber and subsequent hysteretic heat build-up in the tire – which is appreciably reduced in radial tires due to triangulation. A schematic depiction of the load-deflection behavior in uniaxial tension of the crown region of a triangulated radial tire belt vs. that of the pantographing bias tire crown region is shown in Figure 3. These plots show the increased strength and stiffness effected by triangulation.

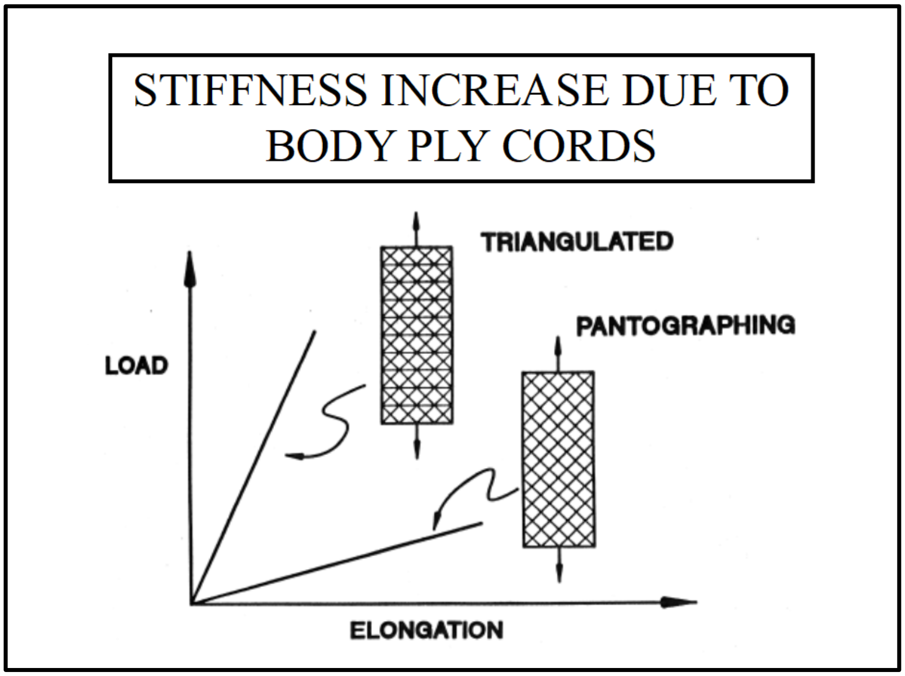

Figure 3. Stiffness and Strength of Triangulated Radial vs. Pantographing Bias Tire Crown

Increased levels of triangulation, structural strength and rigidity are achieved in higher speed rated passenger car radial (PCR) tires via cap plies, usually of circumferentially oriented nylon or Kevlar. Because of the more severe operational service conditions of heavy truck tires, enhanced triangulation is achieved by means of three or more belt plies, usually of steel cord.

Another manifestation of the belt strength of radial tires compared to the bias ply tire is shown by testing tires under controlled laboratory conditions at increasing levels of inflation pressure until they burst. Burst pressure failures in passenger car tires of bias construction typically occurred at 240-260psi – about ten times the rated pressure of tires of the era when FMVSS 109 was developed. The failure zone occurred typically in the tread/crown region of the tire where cord loads are highest and when the tensile strength of the reinforcing cords was exceeded by the imposed inflation pressure. Bias ply tires for passenger cars of that era were normally available in two or four ply construction – both for new cars and as replacement units. Two-ply bias tires with low cord density (ends per inch) were inexpensive, but not structurally robust, and suffered burst failures at even lower inflation pressures due to reduced cord strength.

The plunger test of FMVSS 109 was presumably developed to keep these types of tires off of the nation's highways. On the other hand, burst failures of radial passenger car tires, then and today, typically occur at pressures in excess of 350psi, and rarely if ever occur in the crown region because of the many-fold increase in strength of that region compared to bias constructions. This is due to the presence of two steel belt plies supported by a polyester body ply, or similar material, compared to the less robust bias ply tire construction. Burst failures normally occur in the bead region of radial tires when the tensile strength of the bead bundle is exceeded due to the increasing level of inflation.

V. BEAD UNSEAT TEST COMMENTS RELEVANT TO TODAY'S TIRES

Underinflated bias (or belted-bias) tires of the 1960s through the 1970s could suffer bead unseating during extreme cornering, or high lateral "g" maneuvers, usually conducted under controlled proving ground conditions. It was presumed that this condition could be simulated by the bead unseat component of FMVSS 109 – though the undersigned is unaware of any data showing correlation between bead unseat test results and bead unseating during highway service. The principal reasons for bead dislodgement under these conditions were due to the facts that tire aspect ratios at that time were relatively high and inflation pressures were relatively low compared to today. Consider the changes related to tires that have occurred over the past 50 years that render the laboratory bead unseating test an inappropriate predictor of unseating or dislodgement of today's tires during highway service: higher inflation pressures, lower aspect ratios, increased bead strength and mandated TPMS for new cars, light trucks and SUVs.

Tire inflation pressure and aspect ratio trends have been previously discussed. Both trends tend to promote bead retention; even under total loss of pressure, today's lower aspect tires tend to stay in contact at the bead seat and rim flange interface. *This is because lower aspect ratios are synonymous with wider section tires requiring increased rim widths – both enhancing bead retention in event of low-pressure operation.*

During the 10 to 15 year transition from bias to radial tire constructions in the US, it was observed that radials had to be designed with increased bead strength compared to comparably sized bias tires. So-called "4 x 4" tape or creel beads were sufficient and the norm for bias constructions fitted to main stream cars of the time. These beads contained four rows and four columns (16 bead wire cross-sections) of 0.038in diameter bronze coated steel cord. Due to the greatly increased bead tensions induced in the radial construction due to body ply cord angles at the bead, "5 x 5" constructions (25 bead wire cross-sections) were required to provide adequate bead strength for radials in service. Consequently, burst pressures in radials typically exceeded 350psi. *These heavier weight and stronger beads have a larger bead-bundle cross-section, and tend to remain in place in the event of low-pressure tire service. This is because the larger cross-sectional geometry places more rubber on the bead seat contact area. Further enhancing this tendency to remain in place is the use of today's ever higher inflation pressures to reduce rolling resistance. Even in the event of total pressure loss, lower aspect ratio tires tend to remain in place in the bead seat-rim flange area while providing somewhat limited runflat capability.*

While runflat tire constructions remain a niche product, by specification such tires must have the minimum capability of traveling 50 miles at 50mph while unpressurized. Such requirements can only be met with both beads firmly lodged on the bead seat against the rim flange. Fifty-five and 60 Series runflats meet these requirements. Lower aspect ratio tires easily exceed the requirements.

Further, consider that the profile geometry of the tire bead region is designed to conform with the geometry of the rim flange, while the gage of rubber between the bottom of the bead bundle and the bead seat of the rim is designed to produce a compression fit. This is why uninflated tires require an excess pressure above atmospheric to securely mount on the rim – and this compression fit remains during service.

Lastly, with the total OEM adoption of tire pressure monitoring systems (TPMS) about 15 years ago, today's motorists are much more cognizant of low tire pressures. When overnight temperatures first drop significantly in colder climes, this is evidenced by the queues at the air pressure column at refueling stations, a new normal for consumer behavior not seen in years past.

VI. CONCLUSION

Due to the present and trending state of tire technology and related requirements (inflation pressures, aspect ratios, bead strength, runflats and TPMS), it seems that the plunger and bead unseat tests contained in FMVSS 109 are not valid predictors of tire safety. These obsolete, unnecessary and outdated tests should be removed from the Code of Federal Regulations.

Submitted by:

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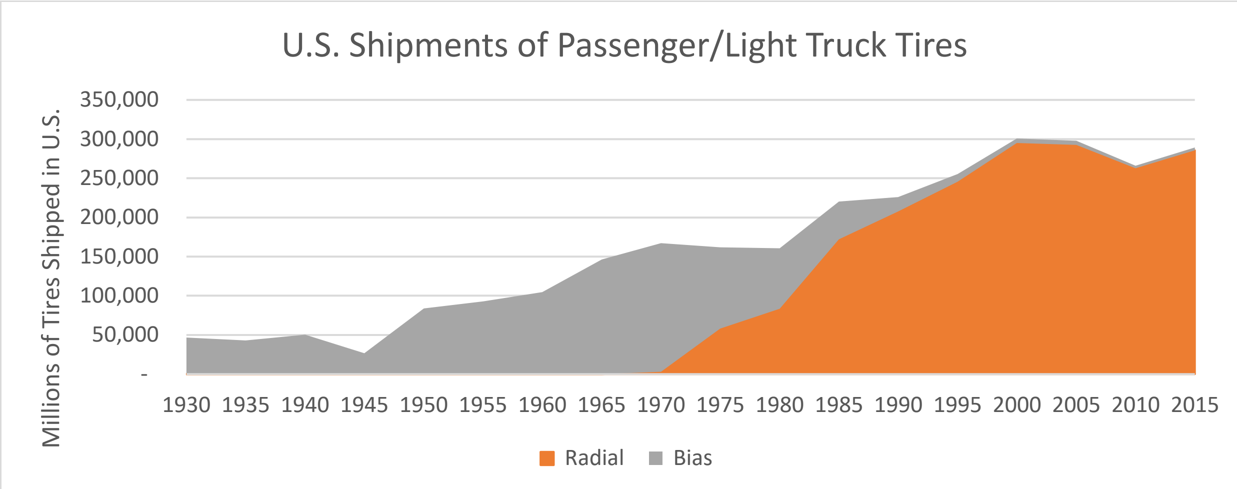
[1, 2] Tire Construction definition and diagrams from Committee for the National Tire Efficiency Study, Transportation Research Board of the National Academies, Radial-Ply Tires and passenger vehicle fuel economy: informing consumers, improving performance (2006).

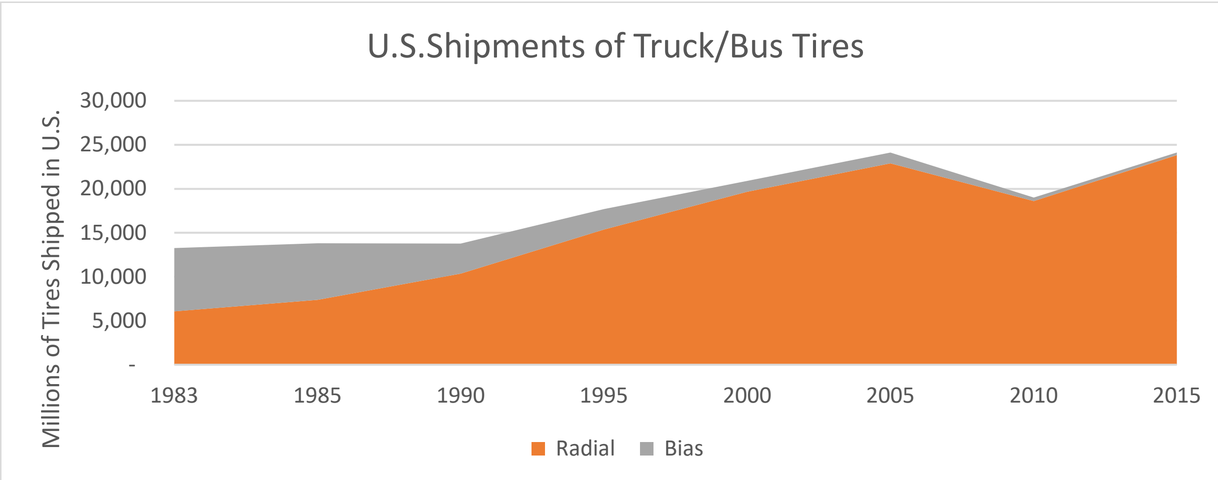
Appendix 2: Total U.S. Passenger/Light Truck Shipments 1929 – 2018 (millions of tires)



Year	Radial	Bias	Total	% radial
1929	-	61,429	61,429	0%
1930	-	46,784	46,784	0%
1935	-	43,100	43,100	0%
1940	-	50,463	50,463	0%
1945	-	26,577	26,577	0%
1950	-	83,781	83,781	0%
1955	-	92,690	92,690	0%
1960	-	104,753	104,753	0%
1965	-	146,306	146,306	0%
1970	2,890	164,253	167,143	2%
1975	58,103	103,647	161,750	36%
1980	83,442	77,202	160,644	52%
1985	171,885	48,209	220,094	78%
1986	182,380	40,179	222,559	82%
1987	182,035	22,772	204,807	88.9%
1988	191,838	17,588	209,426	91.6%
1989	188,737	13,587	202,324	93.3%
1990	207,608	18,388	225,996	91.9%
1991	207,954	14,067	222,021	93.7%
1992	226,184	12,250	238,434	94.9%
1993	233,762	11,917	245,678	95.1%
1994	248,432	11,238	259,670	95.7%
1995	245,572	9,815	255,388	96.2%

Year	Radial	Bias	Total	% radial
1996	256,609	9,249	265,858	96.5%
1997	264,094	8,258	272,352	97.0%
1998	273,761	7,201	280,962	97.4%
1999	288,817	6,310	295,126	97.9%
2000	294,807	5,913	300,720	98.0%
2001	278,078	4,888	282,966	98.3%
2002	284,777	5,023	289,800	98.3%
2003	285,744	4,845	290,589	98.3%
2004	290,988	4,916	295,905	98.3%
2005	292,493	5,272	297,766	98.2%
2006	277,524	5,388	282,911	98.1%
2007	283,641	5,270	288,912	98.2%
2008	258,861	4,863	263,724	98.2%
2009	241,503	2,887	244,389	98.8%
2010	262,670	3,310	265,980	98.8%
2011	259,001	3,915	262,915	98.5%
2012	258,274	5,008	263,283	98.1%
2013	269,578	5,747	275,325	97.9%
2014	282,014	5,576	287,590	98.1%
2015	285,748	3,623	289,371	98.7%
2016	290,611	4,149	294,760	98.6%
2017	287,701	3,914	291,616	98.7%
2018	298,397	3,760	302,156	98.8%

Appendix 3: Total U.S. Truck/Bus Tire Shipments 1983 – 2018 (millions of tires)



Year	Radial	Bias	Total	%radial
1983	6,062	7,191	13,253	46%
1984	6,854	7,378	14,232	48%
1985	7,381	6,434	13,815	53%
1986	7,892	5,647	13,539	58%
1987	9,103	5,179	14,282	64%
1988	9,850	4,680	14,530	68%
1989	9,938	3,915	13,853	72%
1990	10,344	3,439	13,783	75%
1991	9,811	2,692	12,503	78%
1992	11,420	2,347	13,767	83%
1993	12,988	2,874	15,863	81.9%
1994	14,950	2,702	17,652	84.7%
1995	15,381	2,315	17,695	86.9%
1996	14,725	1,630	16,355	90.0%
1997	16,522	1,539	18,061	91.5%
1998	18,506	1,500	20,006	92.5%
1999	20,518	1,327	21,845	93.9%
2000	19,648	1,260	20,907	94.0%
2001	16,326	968	17,294	94.4%
2002	17,876	977	18,853	94.8%
2003	18,868	1,116	19,984	94.4%
2004	21,287	1,082	22,369	95.2%
2005	22,877	1,240	24,117	94.9%
2006	22,719	968	23,687	95.9%
2007	20,289	933	21,221	95.6%

Year	Radial	Bias	Total	%radial
2008	18,085	590	18,674	96.8%
2009	14,914	389	15,303	97.5%
2010	18,603	382	18,986	98.0%
2011	21,120	334	21,454	98.4%
2012	20,618	302	20,920	98.6%
2013	20,190	345	20,535	98.3%
2014	22,744	376	23,120	98.4%
2015	23,826	285	24,111	98.8%
2016	23,207	388	23,595	98.4%
2017	24,812	301	25,113	98.8%
2018	27,866	401	28,267	98.6%

Appendix 4: USTMA Testing Results: FMVSS 139 Endurance/Low Pressure, Bead Unseating and Plunger energy Test Results for Tires that Failed the FMVSS 139 Endurance/Low Pressure Test

FMVSS 139 Endurance/Low Pressure Test Results

TEST TIRE	Tire Size	Load Range	Load Index	Speed Rating	Max Press	Max Load	Construction	Total Hours	Test Comments	Meets Min. Test Requirements
TIRE A	LT285/75R16	D	122/119	S	65/65	3305/3000	2P 2P2S1N	38.0	sidewall sep	No
Tire B	LT235/85R16	E	120/116	R	80/80	3042/2778	2P 2P2S1N	17.3	tread and belt sep	No
Tire C	LT265/70R17	E	121/118	Q	80/80	3195/2910	3P 3P3S1N	33.0	sidewall sep	No
Tire D	265/75R16LT	E	123/120	Q	80/80	3417/3086	2P 2P2S2N	38.0	lower sw sep	No
Tire E	LT285/75R16	E	126/123	R	80/80	3747/3415	2P 2P2S1N	26.0	belt ege sep	No
Tire F	LT285/75R16	E	126/123	R	80/80	3747/3415	2P 2P2S1N	24.1	sidewall sep	No
Tire G	LT265/70R17	E	121/118	R	80/80	3195/2910	2P 2P2S1N	34.0	lower sw sep	No
Tire H	LT265/75R16	E	123/120	S	80/80	3415/3085	2P 2P2S1N	38.0	lower sw sep	No
Tire I	LT245/75R16	E	120/116	R	80/80	3086/2755	2P 2P2S1N	37.7	sidewall sep	No
Tire J	LT285/75R16	E	126/123	Q	80/80	3750/3415	2P 2P2S2N	38.0	sidewall sep	No
Tire K	265/70R17		115	T	44	2679	2P 2P2S1N	38.0	lower sw sep	No

FMVSS 139 Bead Unseating Test Results

TEST TIRE	Tire Size	Load Range	Load Index	Speed Rating	Beat unseating	BU Value	DOT Min	% Above Min
TIRE A	LT285/75R17	D	122/119	S	Pass	6669	2500	167
Tire B	LT235/85R16	E	120/116	R	Pass	6800	2500	172
Tire C	LT265/70R17	E	121/118	Q	Pass	7114	2500	185
Tire D	LT265/75R16	E	123/120	Q	Pass	6289	2500	152
Tire E	LT285/75R16	E	126/123	R	Pass	7025	2500	181
Tire F	LT265/70R17	E	121/118	R	Pass	6936	2500	177
Tire G	LT265/75R16	E	123/120	S	Pass	6495	2500	160
Tire H	LT245/75R16	E	120/116	R	Pass	6018	2500	141
Tire I	LT285/75R16	E	126/123	R	Pass	8166	2500	227
Tire J	265/70R17		115	T	Pass	3412	2500	36
Tire K	LT285/75R16	E	126/123	Q	Pass	7236	2500	189

FMVSS 139 Plunger Energy Test Results

TEST TIRE	Tire Size	Load Range	Load Index	Speed Rating	Plunger Energy	PE Value	DOT Min	% Above Min
TIRE A	LT285/75R17	D	122/119	S	Pass	6455	4550	42
Tire B	LT235/85R16	E	120/116	R	Pass	8341	5100	64
Tire C	LT265/70R17	E	121/118	Q	Pass	7721	5100	51
Tire D	LT265/75R16	E	123/120	Q	Pass	5236	5100	3
Tire E	LT285/75R16	E	126/123	R	Pass	5980	5100	17
Tire F	LT265/70R17	E	121/118	R	Pass	5996	5100	18
Tire G	LT265/75R16	E	123/120	S	Pass	5313	5100	4
Tire H	LT245/75R16	E	120/116	R	Pass	5967	5100	17
Tire I	LT285/75R16	E	126/123	R	Pass	8595	5100	69
Tire J	265/70R17		115	T	Pass	9100	2600	250
Tire K	LT285/75R16	E	126/123	Q	Pass	7636	5100	50

ATTACHMENT B

PARASITIC TREAD BLOCK CHUNKING SHOULD BE ELIMINATED AS A TEST FAILURE CONDITION IN FEDERAL MOTOR VEHICLE SAFETY STANDARD (FMVSS) No. 139 ENDURANCE/LOW PRESSURE TEST

USTMA advocates that NHTSA eliminate parasitic tread block chunking (PTBC) as a test failure condition in Federal Motor Vehicle Safety Standard No. 139 ("FMVSS 139")[1] endurance/low pressure test because it places an unnecessary burden on tire manufacturers without a commensurate safety benefit. PTBC is a testing phenomenon due to the buildup of sticky rubber on the test wheel. For the reasons described below, PTBC does not occur in the field or indicate any concern with tire performance. In fact, it stifles innovation by limiting the use of new tire compounds and technologies that have the potential to deliver superior performance.

I. Background and Historical Context

The FMVSS139 endurance/low pressure laboratory test was created to validate tire endurance by screening for tire structural issues such as tread separation, belt edge separation, sidewall separation, etc. This test has demonstrated a good track record of screening out poor performers as evidenced by its detection of various tire defects in about 8 percent to 13 percent of the tires included in USTMA testing of import tires. Tires that fail this test fall into two categories:

1) Tires <u>with</u> structural problems (sidewall failures, belt separation, etc.)
2) Tires <u>without</u> structural problems, but with parasitic tread block chunking (PTBC) that is atypical of what would be seen during normal highway use.

[1] 49 CFR § 571.139 - Standard No. 139; New pneumatic radial tires for light vehicles.

The Rubber Manufacturers Association (USTMA was known as Rubber Manufacturers Association, or RMA, until 2017), the Japan Automobile Tyre Manufacturers Association (JATMA) and the European Tyre and Rim Technical Organization (ETRTO), petitioned for reconsideration related to PTBC after the final rule was issued in 2003. When NHTSA decided not to remove tread chunking as a test failure condition, the main reason stated was as follows:

> *The agency decided against eliminating "chunking" as a test failure condition because we did not receive data demonstrating that some fixed percentage of a tire's tread could break away without detrimental effect on safe vehicle operation.*
>
> *In real world driving conditions, operating a vehicle with chunked tires creates a potential safety hazard due to wheel imbalance and vehicle vibrations. Further, allowing tread chunking just short of exposing the reinforcement cords would create an unacceptable risk of imminent tire failure. Finally, we note that international standards such as ECE R 30 and ECE R 54 also deem tire chunking to be an indication of a safety problem.*[2]

Tire manufacturing industry experience with applying this test over the past fifteen years indicates that this PTBC is caused by the adhesion between the tire and the steel roadwheel surface and is not relevant to normal on-vehicle use. This PTBC should not be confused with tread chunking that exposes reinforcing material (e.g., nylon overlay or steel belts). This latter type of chunking *would* be an endurance concern and *should* be retained as a failure mode. The tire manufacturing industry proposes to work with NHTSA on defining the specific tread chunking conditions that constitute endurance concerns and those that do not.

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[2] 71 Fed.Reg 877 (January 6, 2006) at 880. Of particular note, ECE R 30 and ECE R 54, do not contain an endurance test analogous to the FMVSS 139 endurance test. Chunking is listed as a failure mode in the highspeed tests contained in these regulations, as it is in the FMVSS 139 high speed test. USTMA is not advocating that chunking be removed as a failure mode in the FMVSS 139 high speed test. USTMA members do not see parasitic tread block chunking in the high speed test.

It is USTMA's position that demonstrating "*some fixed percentage of a tire's tread could break away without detrimental effect on safe vehicle operation*"[3] is not necessary because the PTBC produced by the FMVSS 139 endurance/low pressure test *does not occur in the real world*. Instead, it is an unintended result of the laboratory test itself. Since PTBC does not occur in real world operating conditions, it should not be a criterion for determining whether a tire passes or fails the test. Elimination of PTBC as a pass/fail criterion would also eliminate the need for testing tires marked with the Alpine symbol (i.e., 3PMSF) at a reduced speed of 110 km/h. Therefore, USTMA recommends suppression of PTBC as a failure mode for the FMVSS 139 endurance/low pressure test.[4]

II. Tire Manufacturing Industry Advancements and Impacts since 2005

Tread compound and tread pattern technology must continue to evolve to improve tire performance characteristics that are related to key consumer needs such as wet grip, snow traction, treadwear and rolling resistance. Wet grip and snow traction are key to consumer safety while treadwear and rolling resistance are key for environmental performance and product value to consumers. The sophisticated, high-tech tread compounds used to improve these key performances are often more susceptible to PTBC.

Significant R&D resources are invested trying to overcome PTBC, leading to increased costs and significant development delays. The efforts are not always successful, which means that some innovations in technology cannot be introduced into the U.S. market. Not only is this an issue for tire manufacturers, but it is also an issue for consumers as they are deprived of tire innovations that would

[3] *Id.*
[4] See Docket No. NHTSA-2003-15400-0013: "Rubber Manufacturers Association – Additional Information" for details of proposed wording for tread chunking that would result in test failure.

improve the wet grip and/or snow traction performance thus improving driving safety. Consumers are also deprived of improvements in other aspects of performance, like treadwear and rolling resistance, which could help reduce the overall cost of driving. These technologies/innovations remain on the shelf only because they generate PTBC on the FMVSS 139 endurance/low pressure test:

- Tread compounds which could deliver as much as 20 percent increase in wear life
- Tread compounds which could deliver up to 5 percent improvement in rolling resistance
- Tread compounds which could deliver 3 percent to 10 percent improvement in wet grip
- Tread patterns which could deliver 5 percent to 15 percent improvement in snow traction
- Tread patterns which could deliver improved wet and snow traction in a worn state
- Combination of compound and pattern which could deliver an improved balance of wet and snow performance

These levels of improvement are generally viewed as significant in the highly competitive tire industry. It is not uncommon that tire manufacturers have reliable, effective, safe tread compounds used in other regions of the world which cannot be applied to tires for the U.S. market only because they exhibit PTBC and cannot pass the FMVSS 139 endurance/low pressure test.

Tire manufacturers also incur increased costs in an attempt to design around the PTBC phenomenon. These redesigns also take considerable time, which leads to delayed product launches and lost margins. These redesigns are necessary only because the original design exhibited PTBC on the FMVSS 139 endurance/low pressure test. For example, the cost to redevelop a tread pattern or conduct an additional design loop for a tread compound can range between $30,000 and $500,000 per occurrence, depending on how much of the design cycle must be repeated to address the issue in a particular case.

At least one USTMA member company has had to incur the expense of recalling product due to FMVSS 139 endurance/low pressure test failure caused by PTBC. It was a test-induced noncompliance, and a safety risk was not indicated because there was no field evidence of endurance or safety concerns with the subject tires.

III. <u>The Damage Mechanism that Causes PTBC</u>

The damage mechanism involved with PTBC is important to understand because tire running conditions on the smooth, steel, curved roadwheel are very different than on the road surface, especially in the interface of the tire and the road or roadwheel. These differences include the following factors in the damage mechanism:

1) Curved versus flat surface
2) Increased operating temperature of the tire (+15°C to 25°C)
3) Evolution of rubber properties
4) Sticky rubber buildup on drum
5) Increased adhesion of tire to roadwheel ("bubble gum" effect)
6) Even higher operating temperatures due to this adhesion
7) Reduced rubber strength which leads to rubber tearing and block chunking

The steps in the damage mechanism are described below.

A 2008 paper published in *Tire Science and Technology* ("Flat versus Curved Contact Surfaces Effect on Consumer P-Metric and LT Tire Operating Temperature" by Spadone and Bokar) states that

> *rolling stress and resultant operating temperature is critical to the endurance of a tire. There are fundamental differences between the tire stresses when operating on a flat surface, as experienced in normal highway use, and on a cylindrical laboratory test wheel."* The paper further states *"there are substantially higher tire stresses and temperatures on a curved test wheel"* compared to a flat road surface. *"Consequently,*

> *these more severe test conditions can cause atypical end-of-test (EOT) events, such as tread chunking, which are a result of the testing itself. In such cases, the test termination does not correspond to what would have taken place during normal on-vehicle use.*[5]

As a result, tires that would have excellent durability performance on the road can fail to qualify due to atypical EOT results.

The study made temperature measurements at the tire belt edge for tires running on both flat and curved surfaces under designed ranges of load, pressure and speed. All tests showed that the belt edge temperatures were significantly higher when running on the roadwheel compared to running on a flat surface. In one example, for test conditions aligned with the FMVSS 139 endurance/low pressure test, a LT265/75R16 LRE all-season tire showed roadwheel belt edge temperatures approximately 25°C higher than those seen for an on-vehicle highway test of the same tire. This offset in temperature will vary with tire type but will typically be at least 15°C and can be significantly higher than the 25°C for the example above. This difference in temperature is considered very significant in the tire industry.

Another finding of the study was the development of two simple rule-of-thumb comparisons to illustrate the increased severity of testing on a roadwheel versus a flat surface.

1) Given equivalent load, pressure and speed between roadwheel and highway conditions, the effective load on the roadwheel is 5 percent higher than on the highway, and the effective tire pressure on the roadwheel is 5 percent lower than on the highway.

2) Given equivalent load, pressure and speed between roadwheel and highway conditions, the effective speed on the roadwheel is 16 kph (10 mph) higher than on the highway.

Loading a tire on a curved roadwheel results in increased stress, strain and heat generation in the tread blocks of the tire's shoulder which is equivalent to running at higher load, lower pressure and

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[5] L. Spadone and J. Bokar, *Flat versus Curved Contact Surfaces Effect on Consumer P-Metric and LT Tire Operating Temperatures,* Tire Science and Technology 2008 36:2, 129-145 (2008).

higher speed compared to highway conditions. Figure 1 below shows PTBC. Due to the higher operating temperature, the more sophisticated, high-tech tread compounds begin to undergo a diffusion process which causes the tread compound to become "sticky" and the tire to adhere to the roadwheel. Higher adherence further increases the stresses in the tire, which in turn increases the operating temperature. Finally, at very high temperatures the rubber strength diminishes and small tread blocks between the sipes tear and chunk out.

PTBC can be distinguished from more severe chunking that would not be classified as parasitic chunking. In non-parasitic chunking, the chunking is so severe that the tire's reinforcement plies are exposed. This type of chunking should continue to be considered a failure mode for purposes of the FMVSS 139 endurance/low pressure test. Non-parasitic chunking is showing in Figure 2.

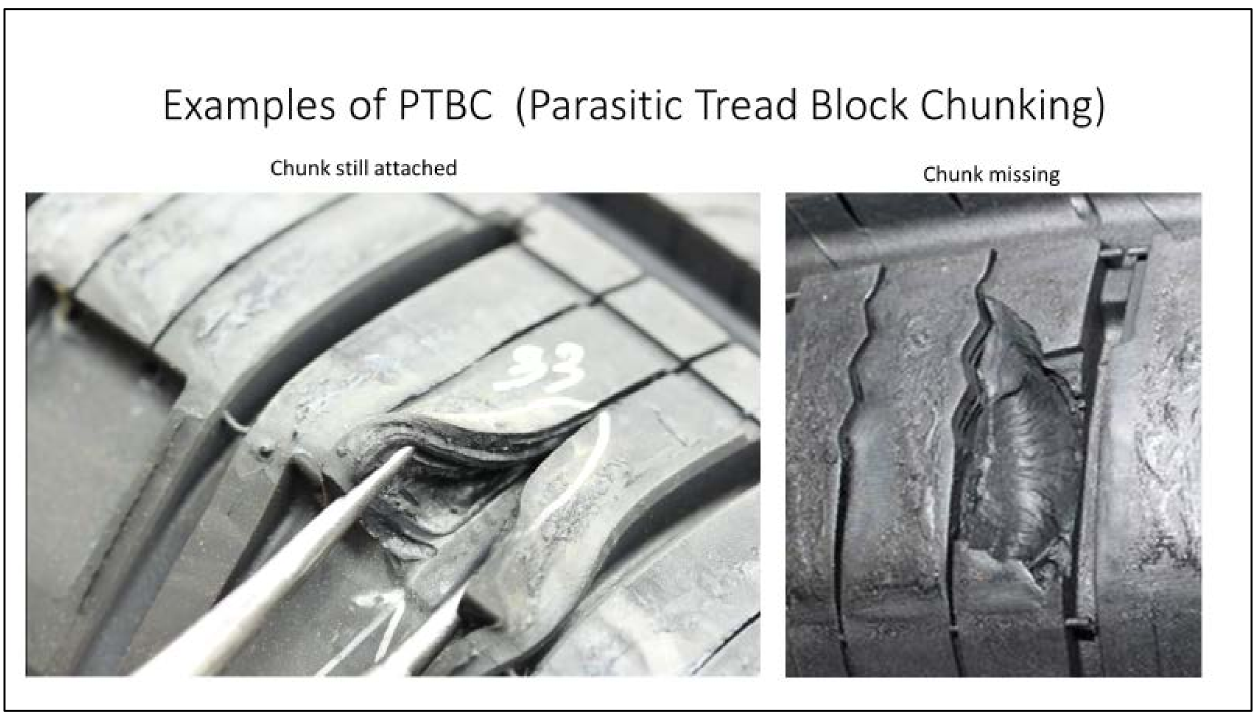

Figure 1. Parasitic Tread Block Chunking (PTBC) example.

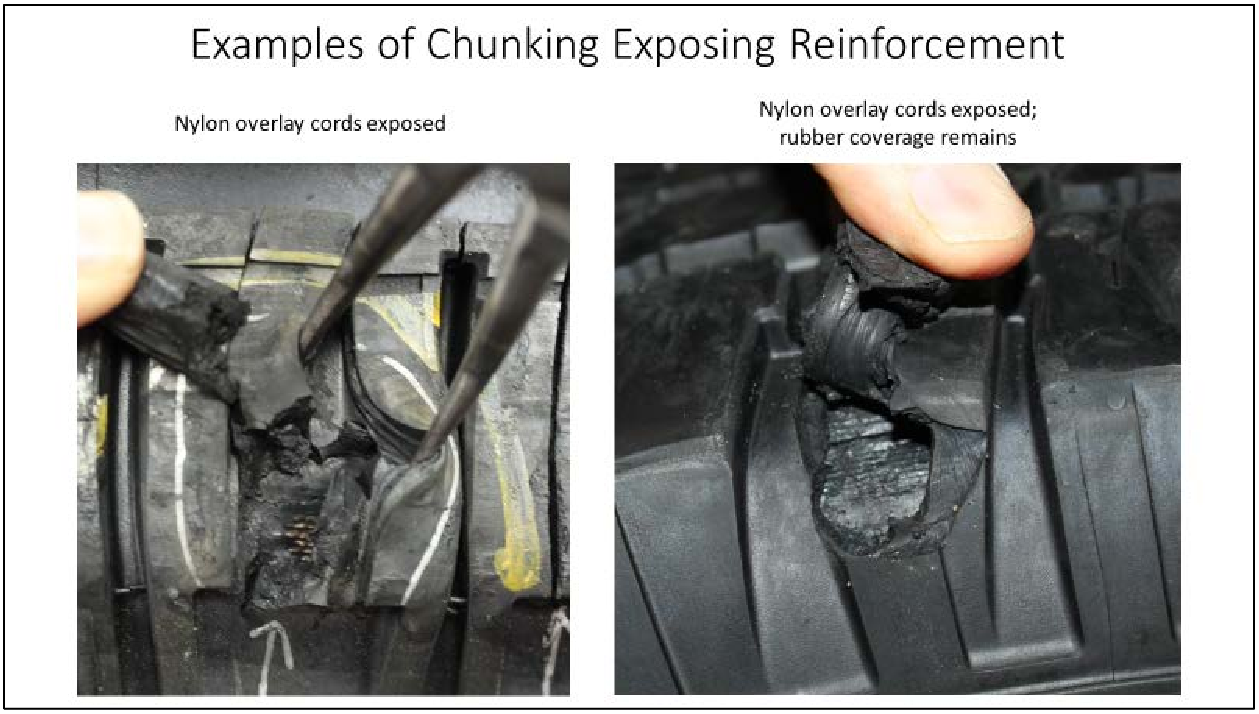

Figure 2. Non-parasitic chunking that exposes reinforcing cords.

This rubber sticking phenomenon does not happen under normal highway operating conditions for multiple reasons. As mentioned earlier, the tread block temperature for highway operating conditions is significantly lower than what can be seen during the FMVSS 139 endurance/low pressure test on a roadwheel at the same elevated ambient temperature. Additionally, the dirt, dust, etc. on real road surfaces that functions as a “third body” (i.e., in addition to the tire and road) at the tire/road interface is not present during roadwheel testing. This has the effect of reducing the tire/road surface adhesion compared to the tire/roadwheel adhesion.

IV. PTBC Is a Testing Artifact and Does Not Occur During Typical Highway Use

PTBC on the FMVSS 139 endurance/low pressure test is not indicative of a tire structural problem. It is benign because it results solely from the adhesion (i.e., “stickiness”) between the tire and roadwheel and does not occur during highway use except in extreme consumer usage conditions that are very different than the conditions of a laboratory FMVSS 139 endurance/low pressure test. Tire chunking due to road aggression from gravel or other debris in the road, shown in Figure 3, is not at all connected with the FMVSS 139 endurance/low pressure test. It can be visually distinguished from PTBC because the tire chunking is in smaller, superficial individual pieces, typically appearing over a broad area of the tread often in a pattern mimicking the profile of the gravel or other debris that caused the phenomenon. Tire manufacturers do not see any correlation between tires that have been found to show signs of tread chunking from road aggression and the occurrence of PTBC in laboratory testing.

Figure 3. Tread chunking observed in the field due to gravel aggression, which can be visually distinguished from PTBC, which is purely a laboratory testing phenomenon.

V. Experimental Validation of Hypothesis That PTBC is Not Indicative of Field Performance

To demonstrate that this type of tread chunking is only an artifact of the FMVSS 139 endurance/low pressure test itself, Michelin ran a comparison test. The reference test was run on a standard 1.7m smooth steel roadwheel which was cleaned prior to testing. The comparison test was run on a 3.05m smooth steel roadwheel. This larger roadwheel reduces the severe shoulder stress and heat generation that results from loading a tire on the 1.7m roadwheel (i.e., comes closer to simulating a flat road surface). Also, this larger roadwheel utilizes a talc application system which helps reduce tire/roadwheel adhesion so that the previously discussed rubber sticking phenomenon does not occur. The talc application introduces a “third body” to the tire/roadwheel interface, not unlike the real-world situation where dirt, dust, etc. are present at the interface between a tire and a road surface.

The tire used for this comparison was an all-season design that previously demonstrated PTBC on the FMVSS 139 endurance/low pressure test. Both the reference and comparison tests targeted a total of 51.5 hours of run time with inspections at 35.5 hours, 39.5 hours and 51.5 hours. The time from 35.5 hours to 51.5 hours continued using the load and pressure values from the FMVSS 139 low pressure test.

VI. Summary and Conclusion

USTMA recommends elimination of PTBC as a failure criterion for the FMVSS 139 endurance/low pressure test. More severe tread chunking that exposes reinforcing material should continue to result in test failure. See Docket item NHTSA-2003-15400-0013: “Rubber Manufacturers Association – Additional Information” for details of proposed wording for tread chunking that *would* result in test failure.

1) PTBC is an artifact of the FMVSS 139 endurance/low pressure test. It does not occur in real-world, highway use.

2) Other distinct chunking “within the tread block” does occur in the field, but only under extreme conditions which have no relationship to the FMVSS 139 endurance/low pressure test (e.g., gravel aggression and very high-speed operation with high torque).

3) Even when “within the tread block” chunking occurs due to very high speed/high torque operation, it is extremely rare, with barely detectable return rates at or near zero parts per million.

4) The extremely small risk to consumers of tread block chunking due to high speed is effectively managed by the FMVSS 139 High Speed test and other standardized tests and regulatory tests in other regions related to the speed symbol marking.

5) The FMVSS 139 endurance/low pressure test effectively screens for tire structural damage (as evidenced by USTMA import tire testing) which should be its focus.

ATTACHMENT C

NHTSA SHOULD MODERNIZE TIRE MARKINGS IN

IN FEDERAL MOTOR VEHICLE SAFETY STANDARD (FMVSS) No. 139

I. Introduction

Tires have useful information molded onto their sidewall. Each tire's "sidewall story" provides beneficial information to both the consumer and the tire service professional. However, not all markings provide the same level of safety benefit and/or assistance in helping consumers make better purchasing choices. USTMA has determined that several markings mandated by FMVSS 139 are obsolete for modern radial pneumatic tires and should be eliminated from the list of tire marking requirements contained in FMVSS 139 S5.5. Elimination of such markings would not pose a safety risk to the consumer or tire service professional.

USTMA advocates that the following mandated tire markings should be eliminated and that doing so will not present any safety concerns and will align with global harmonization efforts:

- Radial Construction FMVSS S5.5(h)
- Cord Material in the Plies FMVSS 139 S5.5(e) and Number of plies FMVSS S5.5(f)
- "TUBELESS" FMVSS S5.5(g) (retain the marking "TUBE TYPE" in the unlikely event a tube type tire is sold in the U.S.)
- UTQG Ratings – USTMA understands that UTQG is a not focus of this ANPRM, however USTMA continues to support the repeal of UTQG requirements as described in its December 2017 comments.

In addition, USTMA advocates that NHTSA amend its markings consistent with the Global Technical Regulation No. 16 for Tyres:

- Service Description containing
    - Load Index
    - Speed Symbol

- Load Range markings (Tyre GTR Section 3.3.1.2.3.3.1)
- Markings for Dual/Single Fitments (FMVSS 119 S6.5.(d))
- Markings for EXTRA LOAD and LIGHT LOAD (Tyre GTR Section 3.3.6)
- Position of Markings

II. **Background**

As tire aspect ratios continue to become lower and the space on sidewalls similarly decreases, the space on tire sidewalls for required markings becomes more valuable. Eliminating some of the markings that are not relevant to safety would result in increased manufacturing flexibility and enhance a tire manufacturer's ability to efficiently make a high quality, high value product. As well, harmonizing with tire markings common globally would reduce trade barriers for U.S. manufacturers and increase the global competitiveness of the U.S. tire industry.

The U.S. government, represented by NHTSA, international governments, and the global tire industry, including USTMA (formerly RMA) and the U.S. tire manufacturing industry, have been active since 1997 with efforts to harmonize best regulatory practices into a global regulatory model for tires. Since the UNECE 1998 Agreement on Establishing Global Technical Regulations ("1998 Agreement") was created, U.S. government and industry identified it as a promising vehicle for achieving harmonized regulatory tests for tires. Work began in earnest in the early 2000s to establish a global technical regulation for tires.

Today, nearly forty nations are contracting parties to the 1998 Agreement and representatives from many of these nations have actively participated in the development of the Global Technical Regulation No. 16 for Tyres ("Tyre GTR"), which was adopted in late 2014 and amended in 2016. The objective of the Tyre GTR "is to establish provisions for new radial pneumatic tyres typically equipping passenger cars and light truck (commercial) vehicles up to and including 4,536 kg (10,000 pounds)."[1] The Tyre GTR provides testing standards and requirements for passenger tires in several key performance areas, including high speed, endurance, low pressure endurance, strength, resistance to bead unseating, rolling resistance, wet grip and noise, in addition to plant codes, markings and dimensions. The United States government (NHTSA) initially abstained from voting on the Tyre GTR in 2014. However, when it was updated in 2016, the United States voted in favor of the amended Tyre GTR. The 2016 affirmative vote binds the U.S. to begin transposing the Tyre GTR into U.S. regulations.

Harmonized provisions for light truck and C-type tires have been completed and will be presented for approval to the United Nations Economic Commission for Europe (UNECE) World Forum for Harmonization of Vehicle Regulations (Working Party 29 or WP.29) during its next session in March 2020. The Tyre GTR harmonizes the existing U.S. DOT Federal Motor Vehicle Safety Standards (FMVSS 109, 139 and 119, where applicable) and existing UN tire regulations (Regulation No. 30, Regulation No. 54 and Regulation No. 117) into a harmonized modular structure for passenger car, LT and C-type radial tires. The 1998 Agreement requires parties to the agreement (called "Contracting Parties") to adopt requirements of a GTR within two years or provide an explanation for the delay and to provide periodic updates to WP29 on progress towards adoption.

USTMA believes the Tyre GTR increases regulatory cooperation among governments and has the potential to reduce non-tariff barriers to trade (technical barriers to trade). In a very competitive global tire industry, the reduction of technical barriers reduces unnecessary and duplicative testing and lowers costs without sacrificing safety, thus increasing the competitiveness of tires manufactured in the United

[1] UNECE World Forum for Harmonization of Vehicle Regulations, Proposal for Amendment No. 2 to UN ETR No. 16 (Tyres); https://www.unece.org/fileadmin/DAM/trans/doc/2020/wp29/ECE-TRANS-WP29-2020-041e.pdf.

States. As a contracting party to the agreement, USTMA encourages the U.S. to implement the agreed rules in the GTR, such as sidewall markings through NHTSA rulemakings.

III. USTMA Recommends Eliminating Certain Sidewall Markings

a. NHTSA Should Eliminate "RADIAL" Construction Tire Marking

FMVSS 139 S5.5(h) requires that a tire with a radial construction must show the word "RADIAL" on the sidewall. A radial tire is also delineated by the character "R" in the size designation.

Today, virtually all tires sold in the United States in the light duty consumer tire market are radial tires. In fact, USTMA data shows that for 2018, of the nearly 302 million U.S. passenger and light truck tire shipments, over 98.8 percent were radial tires. This marking does not convey needed information to consumers or to tire installers and is therefore unnecessary. Additionally, this marking is redundant with requirements for the tire size. The tire size of a radial tire contains the letter "R" in the size designation, which indicates that it is a radial tire, and the "R" should continue to be required in the size designation (e.g., P235/75R15 or LT265/75R16). There is no longer any benefit to requiring the word "radial" to be marked on every tire. With no benefit of the marking, and no detriment to eliminating this redundant marking, USTMA strongly recommends that this marking requirement be eliminated.

a. NHTSA Should Eliminate "Cord Material in the Plies" and "Number of Plies" Tire Marking for Passenger Car Tires

USTMA advocates that NHTSA repeal the requirement in FMVSS 139 that passenger car tire sidewalls be marked with "cord material in the plies" and number of plies. For light truck tires, USTMA advocates that NHTSA reduce the marking requirement for "cord material in the plies" to require only that a tire manufacturer indicate whether a tire has steel cord body plies, due to the different safety precautions that must be used to repair a tire containing steel cord body plies. Also, for steel cord body ply light truck tires, USTMA recommends that NHTSA retain the requirement for sidewall marking to indicate number of plies, since this information may be needed for repair or retreading.

FMVSS 139 S5.5(e) requires that cord material in the plies (sometimes referred to as "ply description") be indicated on the sidewall, while FMVSS 139 S5.5(f) requires that the actual number of plies in the tire be indicated on the sidewall. Currently, ply description is not required in UNECE Regulations 30 and 54 or the current Tyre GTR. Additionally, as tire technology has advanced, the number of plies no longer indicates a tire's robustness and consumers do not purchase tires based on this information.

For passenger car tires, a marking indicating the number of plies is not necessary, since modern radial pneumatic tires intended for passenger car tires are not designed for retreading. In fact, USTMA members do not support retreading of passenger car tires. Similarly, the cord material/ply description marking was originally included to facilitate tire repair, but this information is not needed for the repair of modern passenger car tires. Today, rayon, nylon and polyester are used as ply material in consumer tires, and tires containing any of these fibers can be repaired according to the same guidelines. Regardless of cord material. USTMA specifies proper tire repair procedures for passenger car tires in its manual entitled *Care and Service of Passenger and Light Truck Tires*, which is available for free download at https://www.ustires.org/sites/default/files/CareAndService_PassengerAndLightTruckTires.pdf

Most light truck tires are repaired according to the same guidelines as passenger car tires and do not require either the number of plies or the cord material in the plies to be marked in the tire sidewall. However, some radial light truck tires may contain steel cord body plies. For these tires, it is important to indicate on the tire sidewall that the tire contains steel cord body plies. According to the USTMA manual *Care and Service of Passenger and Light Truck Tires*, a radial tire with steel cord body plies must be serviced very carefully in adherence to the USTMA "Inspection Procedures to Identify Potential Sidewall 'Zipper Ruptures' in Steel Cord Radial Truck, Bus, and Light Truck Tires."[2] Therefore, USTMA recommends that NHTSA eliminate the requirement to mark the type of fabric reinforcement on the tire sidewall of radial light truck tires unless it contains steel cord body plies.

Additionally, some light truck tires may be designed for retreading, depending on manufacturer information and literature. For those tires, information about the number of plies may be useful for retread and repair. A manufacturer could choose to voluntarily mark the number of plies on the sidewall of the tire.

Should a manufacturer make an unintentional error in a "cord material in the plies" or "number of plies" marking, the tire manufacturer most likely will file a petition for inconsequential noncompliance, which NHTSA typically grants. These petitions for inconsequential noncompliance pose an administrative burden on both tire manufacturers and NHTSA associated with filing and processing the petition for inconsequential noncompliance and potentially the cost of conducting a recall. The fact that NHTSA typically grants these petitions demonstrates that these markings are not necessary and do not serve a purpose in protecting or enhancing safety.

Ply rating is not a U.S. requirement for tire stamping. Ply rating is an antiquated term, originally intended for bias ply tires, that corresponds to a load range so both are not needed. Load range should

[2] *See* USTMA Tire Information Service Bulletin, Vol. 33, "Inspection Procedures to Identify Potential Sidewall 'Zipper Ruptures' in Steel Cord Radial Truck, Bus, and Light Truck Tires."

continue to be required in FMVSS 139. However, it is possible that load range eventually gets replaced with Load Index.

b. NHTSA Should Eliminate "TUBELESS" Marking

FMVSS 139 S5.5(g) requires that a tire be marked with either "tubeless" or "tube type". Since virtually all tires sold in the United States today are tubeless, USTMA asks that the requirement to mark "tubeless" be eliminated, consistent with the Tyre GTR. In the unlikely event a tire does happen to be "tube type", then it should still be so marked.

This requirement is outdated and is a vestige of a time when tires in the United States were both tubeless and tube type, and installers and consumers needed to know whether an innertube needed to be installed along with the tire. Today, in the consumer market, tube type technology is obsolete, and indicating that a tire is tubeless does not convey any meaningful information to installers or consumers.

c. NHTSA Should Eliminate Uniform Tire Quality Grading Standards ("UTQG") Markings

USTMA understands that this ANRPM is not focusing on the Uniform Tire Quality Grading Standards, USTMA wishes to reiterate its 2017 comments that the Uniform Tire Quality Grading Standards ("UTQGS") be eliminated, since they are outdated, ineffective at conveying information to consumers and do not reflect performance of modern tires. *See* USTMA comments, which were filed on December 1, 2017 in response to a U.S. Department of Transportation ("DOT") notice requesting comments on existing regulations or other agency actions that would be good candidates for repeal, replacement, suspension, or modification.[3]

The UTQGS were promulgated by NHTSA in 1978 "to aid the consumer in making an informed choice in the purchase of passenger car tires." 49 CFR 575.104(b). While this aim is laudable, the standards do not achieve this goal, instead placing burdens on tire manufacturers (tire development and testing) and NHTSA (course monitoring, compliance assurance auditing) while failing to reach consumers with actionable information. The 40- year old UTQGS requires tire manufacturers to provide ratings for new passenger car tires in three areas: treadwear, wet traction and temperature resistance. Each criterion, test method and rating scale has challenges. In addition, the overall program has several shortcomings that inhibit its ability to provide consumers with information that truly could assist in the tire purchase experience. USTMA reminds NHTSA that these markings are outdated and should be addressed by the agency as part of its regulatory reform efforts.

IV. NHTSA Should Adopt Tire Marking Requirements Contained in the Tyre GTR

USTMA encourages NHTSA to lead other nations that are Contracting Parties to the 1998 Agreement by adopting the tyre marking provisions contained in the GTR. In particular, USTMA urges NHTSA to add mandatory Load Index (LI) to sidewall marking requirements while possibly phasing out the Load Range (LR) marking requirement. According to the statement of technical rational and justification in the proposed Amendment No. 2 of the Tyre GTR, "it is anticipated that the Contracting Parties will incorporate the provisions of UN GTR No. 16 into regulations within their legal framework. This may include applying suitable tyre marking and so help provide for market recognition between the

[3] 82 Fed.Reg. 45750 (October 2, 2017).

Contracting Parties of tyres complying with the provisions of UN GTR No. 16”[4] in order to facilitate broader use of the harmonized markings.

USTMA urges NHTSA to add requirements for sidewall markings for Load Index (LI) tire marking and Speed Symbol tire marking. Most radial passenger and Light Truck tires in North America already have a Load Index and Speed Symbol marked on the tire sidewall.

- **NHTSA Should add Service Description to FMVSS 139 Marking Requirements (Tyre GTR Section 3.3.1.2.3.2)**
    - **Service Description Load Index (LI).** The service description includes the load index (numeric). The numeric load index is a code generally ranging from 50-129 that represents the maximum load carrying capacity. For light truck tires, single and dual application load indices are typically listed.
    - **Service Description Speed Symbol Tire Marking.** The service description includes speed symbol (alpha character). Alpha speed symbols represent the speed capability. The speed symbol indicates the speed category at which the tire can carry a load corresponding to its load index under specified service conditions.
- **NHTSA Should Update the FMVSS 139 requirement for Load Range markings to match the Tyre GTR (**Tyre GTR Section 3.3.1.2.3.3.1), which requires that LT and C-type tires be marked with the words "Load Range" or "LR" followed by the letter B, C. D or E designating the tire load range. This requirement would add clarity to FMVSS 139 S5.5(d), which current only requires “the letter designating the tire load range.” Adding “Load Range” or “LR” specifies the meaning of the

[4] ECE/TRANS/WP.29/2020/41 - (GRBP) - Proposal for Amendment No. 2 to UN GTR No. 16 (Tyres), 20 December 2019, https://www.unece.org/fileadmin/DAM/trans/doc/2020/wp29/ECE-TRANS-WP29-2020-041e.pdf.

letter. In practice, USTMA members are already marking all LT tires according to this provision, so this amendment would add clarity but no new costs to USTMA members.

- **NHTSA Should Update the Markings Requirements in FMVSS 139 for Dual/Single Fitments to match FMVSS 119 S6.5.(d) for Light Truck Tires** to assure that all LT tires are marked consistently, regardless of whether they fall under FMVSS 139 or FMVSS 119. In practice, USTMA members are already marking all LT tires according to this provision, so this amendment would add clarity but no new costs to USTMA members.
- **NHTSA Should add the Requirement in the Tyre GTR for EXTRA LOAD and LIGHT LOAD** (Section 3.3.6). Adding the requirement in FMVSS 139 to mark tires for EXTRA LOAD or LIGHT LOAD would add consistency and clarity to marking requirements, aligned with industry standards. However, in practice this would not add a new burden to USTMA members, since they all already mark tires according to these conventions.
- **NHTSA Should Update Its Requirement for Position of Markings Consistent with the Tyre GTR.** USTMA asks NHTSA to consider changing the location of the markings on at least one side of the tire. This will result in alignment of the GTR No. 16 that states, "**on at least one sidewall, the required markings shall be in a position on the sidewall where they are least susceptible to being "scrubbed" away during use."** The location of sidewall markings is specified by FMVSS 139. S5.5. It states, "The markings must be placed between the maximum section width and the bead on at least one sidewall, unless the maximum section width of the tire is located in an area that is not more than one-fourth of the distance from the bead to the shoulder of the tire. If the maximum section width falls within that area, those markings must appear between the bead and a point one-half the distance from the bead to the shoulder of the tire, on at least one

sidewall." This can be overly restrictive and difficult for low-profile tires including those with rim guards.

V. NHTSA Should Consider Cost Savings Associated with Removal of Certain Sidewall Markings, Allow Voluntary Inclusion of Repealed Markings and Phase-in New Markings

Tire manufacturers would benefit significantly from additional sidewall space being made available for future products, since tire sidewalls represent precious real estate as tire section heights and aspect ratios continue to shrink for new tire sizes. Other associated cost savings will include tire sidewall design time and resources to make sure all required markings fit and tire inspections to assure the required markings are included. Tire manufacturers would also benefit significantly by not being met with a potential non-compliance for inadvertently omitting one of the legacy tire markings currently required, as would NHTSA by not needing to review and process petitions for inconsequential noncompliance in these situations.

For existing products, however, tire companies would incur significant costs should they be required to remove repealed markings or add new markings to existing molds. For repealed markings, USTMA recommends that NHTSA eliminate the marking requirement but continue to allow the marking as a voluntary marking to reduce any potential burden to tire manufacturers with respect to existing molds. If these markings would be required to be removed from existing products, tire manufacturers would incur costs associated with taking molds out of service, welding, engraving, manpower, among others.

Recognizing that adding new marking requirements may potentially pose added costs to some tire manufacturers, USTMA advocates that NHTSA adopt a phase-in period for any markings changes to reduce any burdens on tire manufacturers, consistent with NHTSA's final implementing changes to the

Tire Identification Number. In that rule, NHTSA recognized that a transition period of ten years would eliminate nearly all additional costs associated with a tire marking transition. Similarly, the Tyre GTR technical justification and rationale recognizes that “when adopting the provisions of UN GTR No. 16, it is recommended that countries are given a transition period of up to ten years to minimize costs associated with regulatory changes that require different tyre markings. USTMA also recognizes that since load index and speed symbol are commonly included on tire sidewalls today, implementation costs and other associated burdens would be minimized.