DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 571

[Docket No. NHTSA–03–15400]

RIN 2127–AI54

Federal Motor Vehicle Safety Standards; Tires

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

ACTION: Final rule.

SUMMARY: The Transportation Recall Enhancement, Accountability, and Documentation Act of 2000 mandates that we conduct a rulemaking proceeding to revise and update our safety performance requirements for tires. In response, we are establishing new and more stringent tire performance requirements that will apply to all new tires for use on light vehicles, *i.e.*, those vehicles with a gross vehicle weight rating of 10,000 pounds or less, except motorcycles and low speed vehicles. The final rule increases the stringency of the existing high speed and endurance tests, defers action on proposals to replace the existing strength test and the bead unseating resistance test with a road hazard impact test and a different bead unseating test, respectively, adds a low pressure performance test, and defers action on a proposal to add an aging test. Together with new safety information requirements that we recently established for those tires, the new performance requirements will improve tire safety.

DATES: This final rule is effective June 1, 2007. Voluntary compliance is permitted before that date. If you wish to submit a petition for reconsideration of this rule, your petition must be received by August 11, 2003.

ADDRESSES: Petitions for reconsideration should refer to the docket number and be submitted to: Administrator, Room 5220, National Highway Traffic Safety Administration, 400 Seventh Street, SW., Washington, DC 20590.

FOR FURTHER INFORMATION CONTACT: For technical and policy issues: Mr. George Soodoo or Mr. Joseph Scott, Office of Crash Avoidance Standards, National Highway Traffic Safety Administration, 400 Seventh Street, SW., Washington, DC 20590. Telephone: (202) 366–2720. Fax: (202) 366–4329.

For legal issues: Nancy Bell, Attorney Advisor, Office of the Chief Counsel, NCC–20, National Highway Traffic Safety Administration, 400 Seventh Street, SW., Washington, DC 20590. Telephone: (202) 366–2992. Fax: (202) 366–3820.

SUPPLEMENTARY INFORMATION:

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I. Executive Summary

A. Highlights of the Notice of Proposed Rulemaking

Section 10 of the Transportation Recall Enhancement, Accountability, and Documentation (TREAD) Act mandates that the agency issue a final rule revising and updating its tire performance standards. In response, the agency examined the value of modifying each of the existing tests in its tire standards applicable to tires for light vehicles, *i.e.*, those vehicles with a gross vehicle weight rating of 10,000 pounds or less, except motorcycles and low speed vehicles. In addition, NHTSA examined the value of adopting several new tests. In doing so, it placed particular emphasis on improving the ability of tires to withstand the effects of factors mentioned during the consideration and enactment of the TREAD Act, such as tire heat build up, low inflation, and aging. The agency conducted extensive testing, data gathering and analyses as well as reviewed other existing international, industry and national standards and proposals, and submissions by the public.

As a result of these efforts, the agency identified an array of amendments for revising and updating its tire standards and thereby improving tire performance. In the notice of proposed rulemaking (NPRM) that NHTSA published on March 5, 2002 (67 FR 10050, Docket No. NHTSA–00–8011), the agency proposed to upgrade its existing requirements and test procedures addressing the following aspects of tire performance: Tire dimension, high speed, endurance, road hazard impact, and bead unseating. The agency proposed also to add new requirements that would require that underinflated tires and aged tires provide specified levels of performance.[1] The agency recognized the potential significant cost of some of the proposed amendments, but decided that, in view of the broad mandate in the TREAD Act and the uncertainty associated with the analysis of benefits and costs, the most appropriate course of action was for the agency to seek public comment on the wide array of proposals and use the information in the responses to adjust and refine the amendments.

The highlights of the proposal were as follows:

(1) *High speed and endurance tests*—the current high speed and endurance tests in FMVSS No. 109, *New Pneumatic Tires—Passenger Cars,* 49 CFR 571.109, would have been replaced with a more stringent combination of testing parameters (ambient temperature, load, inflation pressure, speed, and duration.) The proposed high speed test would have specified test speeds (140, 150 and 160 km/h (87, 93, and 99 mph)) that are substantially higher than those currently specified in FMVSS No. 109 (120, 128, 136 km/h (75, 80, 85 mph)). The proposed endurance test would have specified a test speed 50 percent greater (120 km/h (75 mph)) than that currently specified in FMVSS No. 109 (80 km/h (50 mph)), as well as a duration that is 6 hours longer (40 hours total) than that currently specified in FMVSS No. 109 (34 hours total).[2]

(2) *Road hazard impact test and bead unseating test*—these two tests would have been modeled on SAE Recommended Practice J1981, *Road Hazard Impact Test for Wheel and Tire Assemblies (Passenger Car, Light Truck, and Multipurpose Vehicles),* and the Toyota air loss test, respectively. These new tests would have replaced the strength and bead unseating resistance tests in the current FMVSS No. 109 with tests that were believed to be more real-world and more stringent.

(3) *Low inflation pressure performance*—two alternative tests were proposed. Both tests would have utilized tires significantly under-inflated, for instance, 140 kPa (20 psi) for P-metric tires (the low inflation pressure threshold requirement for warning lamp activation in the then proposed Tire Pressure Monitoring System (TPMS) standard, Docket No. NHTSA–00–8572 (66 FR 38982, July 26, 2001)), as the ''inflation pressure'' testing parameter for standard load P-metric tires.

(4) *Aging effects*—three alternative tests were proposed that would have evaluated a tire's long term durability through methods different than and/or beyond those required by both the current and the proposed endurance test parameters. The three tests would have used peel strength testing, long-term durability endurance requirements, and oven aging, respectively.

(5) *Tire Selection Criteria/De-Rating of P-metric Tires*—the agency proposed retaining the de-rating percentage of 1.10 for P-metric tires used on non-passenger car vehicles and revising FMVSS No. 110 to specify that the determination of vehicle normal load (''reserve load'') on the tire be based on 85% of the load at vehicle placard pressure.

Also, the agency discussed revising FMVSS No. 110, *Tire selection and rims,* for passenger cars, 49 CFR 571.110, and FMVSS No. 120, *Tire selection and rims for motor vehicles other than passenger cars,* 49 CFR 571.120, to reflect the applicability of the proposed new light vehicle tire standard to vehicles up to 10,000 pounds GVWR. It also discussed revising FMVSS No. 117, *Retreaded pneumatic tires,* 49 CFR 571.117, and FMVSS No. 129, *New non-pneumatic tires for passenger cars,* 49 CFR 571.129, to replace the performance tests that reference or mirror those in FMVSS No. 109 with those specified in the proposed new light vehicle tire standard.

The agency proposed two alternative implementation schedules for tires: A two-year phase-in under which all applicable tires would have been required to comply with the final rule by September 1, 2004, and a three-year phase-in under which all applicable tires would have been required to comply with the final rule by September 1, 2005. For light vehicles, the agency proposed that all those manufactured on or after September 1, 2004 would have had to comply with the final rule.

The aforementioned proposals are summarized more fully in section IV.B. of this document.

B. Highlights of the Final Rule

In response to the NPRM, the agency received cost data from commenters and other information that assisted it in refining its assessment of benefits and costs and in choosing amendments to fashion a final rule that will offer the American public enhanced tire safety and be consistent with the principles of Executive Order 12866. The resulting final rule establishes new and more stringent tire performance requirements that apply to all new radial tires for use on passenger cars, multipurpose passenger vehicles, trucks, buses and trailers that have a gross vehicle weight rating (GVWR) of 4,536 kg (10,000 pounds) or less and that are manufactured after 1975, and to all new passenger cars, multipurpose passenger vehicles, trucks, buses and trailers that have a GVWR of 4,536 kg (10,000 pounds) or less. The requirements are fully summarized in section VI.A. of this document.

The agency believes the final rule is a reasoned one that is based on the best currently available information and that will improve tire safety. NHTSA believes that this rule will be effective at ensuring that future tires will have their strength, endurance, and heat resistance evaluated in a way that will increase the required level of performance.[3] As a result, these tires are expected to exhibit less variability in levels of performance and experience fewer blowouts and tire failures. Additionally, the reserve load requirements of FMVSS No. 110, combined with the de-rating of P-metric tires when used on SUVs, vans, trailers, and pick-up trucks, will provide a

[1] *See* 67 FR 69600; November 18, 2002, for the recently adopted tire information requirements. For the convenience of the reader, we have placed in the docket for today's final rule a document that shows how the tire safety information and performance requirements appear together in Standard No. 139.

[2] At the specified test speed (120 km/h), the proposed endurance test distance (4800 km) would have been almost double the distance accumulated than under the current endurance test (2720 km at 80 km/h).

[3] The agency estimates that 5–11% of tires will have to be modified to meet this final rule.

sufficient safety margin for tires used on light vehicles.

In response to comments from the tire and vehicle industries arguing that the compliance costs were underestimated in the NPRM and in recognition of the limited quantifiable safety benefits, NHTSA has reduced the stringency of some of its proposals and deferred others, to ensure that this rule's safety improvements will be reasonably related to the rule's costs.

C. Adopted Aspects of the NPRM

High speed and endurance—The agency is upgrading the existing high speed and endurance tests, although to a more modest degree than we proposed. Both the high speed test and the endurance test contain testing parameters (ambient temperature, load, inflation pressure, speed, and duration) that make the tests more stringent than those tests currently found in our tire standards, as well as the tests suggested by industry. Most significantly, the high speed test specifies test speeds of 140, 150, and 160 km/h substantially higher than those specified in the passenger car tire standard. Likewise, the endurance test specifies a test speed 50% higher than that currently specified in the car tire standard. Under the new endurance test, a tire is assessed over 50% more distance than a tire must endure under the current endurance test.

Low inflation pressure performance—The agency is adopting a low inflation pressure test that seeks to ensure a minimum level of performance safety in tires when they are underinflated to 140 kPa (20 psi). That is the minimum level of inflation at which tire pressure monitoring system warnings will be required to be activated. This requirement mirrors conditions of long distance family travel and will assist in ensuring that tires will withstand conditions of severe underinflation during highway travel in fully loaded conditions.

Applicability and LTVs—Given the increasing consumer preference for using light trucks for personal transportation purposes, NHTSA is, for the first time, requiring light trucks to have a specified tire reserve, the same as for passenger cars, under normal loading conditions. The agency is also extending the tire performance requirements for passenger car tires to LT tires (load range C, D, and E) used on light trucks.

D. Deferred Aspects of the NPRM

Road hazard impact—Instead of replacing the current strength test with the proposed road hazard test, the agency is retaining the strength test for passenger car and LT tires. Post-NPRM agency testing data and public comments called into question whether the proposed road hazard impact test, which was modeled after a SAE recommended practice, would provide both a more stringent and more real-world test than the current test. The agency will address these uncertainties in the near future. After it conducts research on tire aging and resistance to bead unseating, it will conduct research on road hazard impact. Based on the test results, it will decide whether to initiate rulemaking to adopt a new or revised test.

Resistance to bead unseating—Instead of replacing the current bead unseating test with a proposal based on a Toyota test, the agency is retaining the bead unseating test and extending it to LT tires. Industry previously recommended dispensing with a bead unseating test because radial tires are easily able to satisfy the current one. Results from the agency's 1997–1998 rollover testing provided a strong rationale for upgrading, rather than deleting, the bead unseating test. Post-NPRM agency testing data and public comments, however, called into question whether the Toyota test provides both a more stringent and more real-world test than the FMVSS No. 109 bead unseating test. The agency will conduct research on bead unseating after conducting its research on tire aging, and, based on the test results, decide whether to initiate rulemaking to adopt a new or revised test.

Aging—At this time, the agency is not adopting a test to address the deterioration of tire performance caused by aging. We proposed three alternatives for an aging effects test that would expose tires to the type of failures experienced by consumers at 40,000 kilometers or beyond. Because we had little data and analysis regarding any of these tests and understood the tire industry to be regularly conducting aging testing, we requested comments on which alternative should be adopted. The tire industry did not, however, disclose any of its testing data or provide any analysis in its comments on the NPRM. However, some industry members have recently begun a dialogue and offered to share data with the agency.

In an attempt to gain a thorough understanding of existing aging test mechanisms and methodologies, as well as data and analysis relating to that testing, the agency is commencing its own research on aging. The agency anticipates publishing a NPRM proposing an aging test in approximately two years after this final rule.

Benefits

At the time of the NPRM, we were able to quantify only very slight safety benefits. Given the reductions in several of our proposals and the deferral of several of other proposals, the benefits of the final rule will be less than we then projected. We now estimate 1 to 4 lives saved and 23 to 102 injuries reduced. Nevertheless, the final rule will increase the required level of performance for all tires and will improve the strength, endurance, and heat resistance of the 5–11% of tires that will have to be redesigned or modified to achieve compliance.

Costs

Although in issuing the proposal we were able to estimate costs for only two of the proposed tests, we estimated that those two tests alone would result in costs of almost $300 million per year. However, given the reductions in or deferrals of some of our proposals, we estimate that the final rule will, in its entirety, result in annual costs for new original equipment and replacement tires of $3.6 million to $31.6 million. The net costs per equivalent life saved will be about $5 million based on the mid-point of cost and discounted benefits estimates.

Effective Dates/Implementation

The agency is providing a 4-year lead time for both tire and vehicle manufacturers. All covered tires and vehicles must comply with the amendments by June 1, 2007. In view of the comments by the tire and vehicle industry regarding the extent and significance of design and production changes that might have to be made as a result of changing requirements in an area that has been not substantively revised in 30 years, NHTSA finds that an effective date of June 1, 2007 is more reasonable than the shorter lead time proposed in the NPRM and is in the public interest.

II. Background

A. The Transportation Recall Enhancement Accountability and Documentation Act

Section 10, ''Endurance and Resistance Standards for Tires,'' of the TREAD Act, Pub. L. 106–414, mandates that the agency issue a final rule to revise and update its tire performance standards. However, the Act gives the agency substantial discretion regarding the substance of the final rule. The Act does not specify how the standards should be revised or updated. For example, it does not specify which particular existing performance requirements and test procedures should be improved or how much they should be improved. Likewise, it does not specify which particular new requirements should be added or how stringent they should be.

In response to section 10 of the TREAD Act, the agency comprehensively examined possible ways of revising and updating its tire standards. In doing so, it placed particular emphasis on improving the ability of tires to withstand the effects of factors mentioned during the consideration and enactment of the TREAD Act such as tire heat build up, low inflation, and aging. The agency examined the value of modifying the existing tests in its tire standards. In addition, it examined the value of adopting several new tests.

B. Safety Problem

1. Outdated Performance Requirements

Prior to the enactment of the TREAD Act, the Firestone tire recalls in 2000 focused public attention on the agency's passenger car tire standard, FMVSS No. 109. The standard had not been substantively revised since first issued over 30 years ago in 1967. At that time, nearly all (more than 99 percent) of passenger car tires in the U.S. were of bias, or bias belt construction. Accordingly, the requirements and test procedures in FMVSS No. 109 were developed primarily to address bias tires. Today, bias tires have been almost completely replaced by radial tires on passenger cars and other light vehicles. The use of radial tires has grown to the extent that they represent more than 95 percent of passenger tires in both the U.S. and Europe and are used on most other new light vehicles sold in the U.S.

NHTSA does not require that light vehicles be equipped with radial tires, but regulates radial tire performance through FMVSS Nos. 109 and 119. Radial tires are less susceptible than bias ply tires to most types of failures.[4] Also, the switch to radial tire designs resulted in significant improvements in tire performance compared with bias ply tires. Given the superior performance of radial tires, it is easier for them than for bias tires to comply with the requirements of FMVSS No. 109.[5]

While the durability and performance of tires have improved, the conditions under which tires are operated have become more rigorous. Higher speeds, greater loads, extended lifetimes of tires, longer duration of travel[6] and shifting demographics of vehicles sales[7] have all contributed to much greater stresses and strains being placed upon today's radial tires than those endured by earlier generation radial tires.

The characteristics of a radial tire construction in conjunction with present usage and purchasing patterns render the existing required minimum performance levels in the high-speed test, endurance test, strength test[8], and bead-unseating test ineffective in differentiating among today's radial tires with respect to these aspects of performance.

2. Safety Problems Associated With Tires

Essentially, the size of the tire problem has remained the same over the last eight years. With the increasing sales of light trucks, and the fact that light trucks have more tire problems than passenger cars, the problem has shifted more toward light trucks and away from passenger cars. As discussed in the NPRM, several crash files contain information on ''general'' tire related problems that precipitate crashes. The more recent of these files are the National Automotive Sampling System—Crashworthiness Data System (NASS–CDS)[9] and the Fatality Analysis Reporting System (FARS).[10]

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[4] A radial passenger car tire carcass is typically made up of one or two plies of cord material that run from bead to bead at an angle of approximately 90 degrees to the centerline of the tire. As a result, the cords do not crisscross. Because the cords do not crisscross and because the opposite ends of each cord are anchored to the beads at points that are directly opposite to each other, the radial tire sidewall is more flexible than that of a bias tire and the treadface is less flexible. The radial tire is reinforced and stabilized by a belt that runs circumferentially around the tire under the tread. This construction allows the sidewalls to act independently of the belt and tread area when forces are applied to the tire. This ''independent'' action is what allows the sidewalls to readily absorb road irregularities without overstressing the cords. Impact breaks caused by cord rupture do not occur in radial-ply passenger car tires. This ''independent'' action also allows two important things to happen during cornering: (1) The tread of a radial tire remains fully in contact with the road over the entire tread width, and (2) the ply cords and sidewall are able to absorb the cornering forces without exerting the twisting force on the beads that are exerted by bias constructions.

[5] A bias passenger car tire carcass is typically made up of two or four plies of cord material that run from bead to bead at an angle of approximately 35 degrees to the centerline of the tire. Alternating plies are applied at alternating angles during tire manufacture so that the cord paths of alternating plies crisscross. This type of construction provides a very strong, durable carcass for the tire. However, it has drawbacks. Because the ply cords crisscross and all the cords are anchored to the beads, the sidewall is stiff and treadface is flexible. This type of construction prevents different parts of the tire from acting independently of one another when forces are applied to the tire. As a result, a bias construction is susceptible to impact breaks because it does not easily absorb road irregularities.

[6] Passenger cars average 12,258 miles per year during the first 6 years after purchase, while light trucks average 12,683 miles per year during the same time period. NPTS data also indicates that minivans make the most person-trips per day, followed by SUVs, passenger cars, and finally pickups. SUVs are estimated to make, on average, 4.6% more person-trips per day than passenger cars. Also, the 1995 Nationwide Personal Transportation Survey (NPTS) data set suggests that the average light duty truck (LDT) (pickup trucks, SUVs, and minivans) is used over longer distances and with more people aboard than passenger cars. Additionally, SUVs are popular for long distance weekend travel.

[7] Americans have shifted toward a significantly higher use of minivans, pickup trucks, and SUVs for personal travel. (*Journal of Transportation and Statistics*, December 2000). Sales of light trucks have risen steadily for over the past 20 years and now account for almost half of the U.S. light vehicle market—more than twice their market share as recently as 1983. (*Industries in Transition,* 1/01/00; *Journal of Transportation and Statistics*, December 2000.) Sales growth of heavier light trucks, those that have GVWRs above 6,000 pounds, increased at a much faster rate than their lighter counterparts, with larger SUVs (6,000–10,000 pounds GVWR) showing an average increase of 38 percent annually between 1990 and 1998.

Approximately 90 percent of these light trucks use passenger car (P-metric) tires. The other 10 percent use light truck (LT) tires load range C, D, or E tires, which are typically used on heavier light trucks with a gross vehicle weight rating (GVWR) between 6,000 and 10,000 pounds. Continued growth in the sales and production of light truck vehicles also drove the number of original equipment light truck (LT) tires to a record high of approximately 8.4 million units or a 25.2 percent increase over 1998's figures. (*RMA 2000 Yearbook*)

[8] 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.

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.

[9] For the NASS–CDS system, trained investigators collect data on a sample of tow-away crashes around the country. These data can be ''weighted up'' to national estimates. A NASS–CDS General Vehicle Form contains the following information: a critical pre-crash event, such as vehicle loss of control due to a blowout or flat tire. This category includes only part of the tire-related problems that cause crashes. This coding would only be used when the tire went flat or there was a blowout that caused a loss of control of the vehicle, resulting in a crash.

[10] In FARS, tire problems are noted after the crash, if they are noted at all. The FARS file does not indicate whether the tire problem caused the crash, influenced the severity of the crash, or just occurred during the crash. For example, some crashes may have been caused by a tire blowout, while in others the vehicle may have slid sideways and struck a curb, causing a flat tire that may or may not have influenced whether the vehicle experienced rollover. Thus, while an indication of a tire problem in the FARS file give some indication as to the potential magnitude of the tire problem in fatal crashes, it can neither be considered the lowest

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NASS–CDS data for 1995 through 1998 [11] indicate that there are an estimated 23,464 tow-away crashes per year coded by the NASS investigators (relying on the police report of the crash) as having been caused by blowouts or flat tires. Based on that estimate, about one-half of one percent of all crashes are caused by these tire problems. The rate of blowout-caused crashes for light trucks (0.99 percent) is more than three times the rate of those crashes for passenger cars (0.31 percent). Blowouts cause a much higher proportion of rollover crashes (4.81) than non-rollover crashes (0.28), and more than three times the rate in light trucks (6.88 percent) than in passenger cars (1.87 percent).

FARS data for 1999 through 2001 show that 1.10 percent of all light vehicles in fatal crashes were coded by investigators as having had tire problems. Light trucks had slightly higher rates of tire problems (1.34 percent) than passenger cars (0.92 percent). The annual average number of vehicles with tire problems in FARS was 528 (255 passenger cars and 273 light trucks).

A further examination of the FARS data indicates that heat is a factor in tire problems. An examination of two surrogates for heat, the region of the U.S. in which the crash occurred, and the season in which the crash occurred, indicates that the highest rates of tire problems occurred in light trucks in southern states in the summertime, followed by light trucks in northern states in the summertime, and then by passenger cars in southern states in the summertime. The lowest rates occurred in winter and fall. Based on these data, tires on light trucks appear to be more affected by higher ambient temperatures than tires on passenger cars.

Examining tire problems in the NASS–CDS from 1992 to 1999 by types of light trucks and vehicle size indicates that LT tires used on light trucks exhibited more problems than P-metric tires. LT tires are used on vehicle classes identified for this analysis as Van Large B and Pickup Large B groups of vehicles. These groups of vehicles typically consist of the ¾-ton and 1-ton vans and pick-ups. P-metric tires are used on most of the other light trucks. The data indicate that the average percentage of light trucks in the NASS–CDS having a LT tire problem is 0.84, while the average percent of light trucks having a P-metric tire problem is 0.47 percent. These larger pickups and vans, however, carry heavier loads and may be more frequently overloaded than lighter trucks. In addition, these heavier vehicles are often used at construction sites and may be more apt to encounter nail punctures and experience flat tires. Thus, there may be usage issues that increase the percentage of tire problems for these larger trucks, rather than exclusively a qualitative difference between P-metric and LT tires.

C. Existing NHTSA Performance Requirements for Tires

The following discussion summarizes existing NHTSA requirements relating to tires.

FMVSS No. 109, *New pneumatic tires*, 49 CFR 571.109, specifies the requirements for all tires manufactured for use on passenger cars manufactured after 1948. This standard, which was issued in 1967 under the National Traffic and Motor Vehicle Safety Act (Safety Act), specifies dimensions for tires used on passenger cars and requires that the tires meet specified strength, resistance to bead unseating, endurance, and high speed requirements, and be labeled with certain safety information. FMVSS No. 109 applies to passenger car (P-metric) tires produced for use on passenger cars, multipurpose passenger vehicles (MPV), and light trucks (sport utility vehicles (SUV), vans, minivans, and pickup trucks). The standard was adopted from the Society of Automotive Engineers (SAE) recommended practice J918c, *Passenger Car Tire Performance Requirements and Test Procedures*, which was first issued by the SAE in June 1965.[12] The current FMVSS No. 109 includes four performance requirements for tires:

- A strength test, which evaluates the strength of the reinforcing materials in the tire;
- A resistance-to-bead unseating test, which evaluates how well the tire bead is seated on the rim (regulating the tire-rim interface guards against sudden loss of tire air pressure when a tire is subjected to lateral forces such as during severe turning maneuvers);
- An endurance test, which evaluates resistance to heat buildup when the tire is run at or near its rated load nonstop for a total of 34 hours; and
- A high-speed test, which evaluates resistance to heat buildup when the tire is run at 88 percent of its maximum load at speeds of 75 mph, 80 mph, and 85 mph for 30 minutes at each speed.

For the purposes of testing tires to determine their compliance with these requirements, the standard specifies values for several factors, such as tire inflation pressure, the load [13] on the tire, and the rim on which a tire is mounted. The standard specifies permissible inflation pressures (or wheel sizes, in the case of bead unseating test) to facilitate compliance testing. The standard requires that each passenger car tire have a maximum permissible inflation pressure labeled on its sidewall (S4.3). Section 4.2.1(b) lists the permissible maximum pressures: 32, 36, 40, or 60 pounds per square inch (psi) or 240, 280, 290, 300, 330, 340, 350, or 390 kiloPascals (kPa). A manufacturer's selection of a maximum pressure has the effect of determining the pressures at which its tire is tested. For each permissible maximum pressure, Table II of the standard specifies pressures at which the standard's tests must be conducted. The intent of this provision is to limit the number of possible maximum inflation pressures and thereby reduce the likelihood of having tires of the same size on the same vehicle with one maximum load value, but with different maximum permissible inflation pressures.

Closely related to FMVSS No. 109 is FMVSS No. 110, *Tire selection and rims*, 49 CFR 571.110. FMVSS No. 110 requires that each passenger car be equipped with tires that comply with FMVSS No. 109, that tires on the cars be capable of carrying the maximum loaded vehicle weight, that the rims on the car be appropriate for use with the tires, and that certain information about the car and its tires appear on a placard in the passenger car. FMVSS No. 110 also specifies rim dimension requirements and further specifies that, in the event of a sudden loss of inflation pressure at a speed of 97 km/h (60 mph), rims must retain a deflated tire until the vehicle can be stopped with a controlled braking application. FMVSS No. 110 initially became effective in April 1968.

FMVSS No. 117, *Retreaded pneumatic tires*, 49 CFR 571.117, establishes performance, labeling, and

possible number because the tire might not have caused the crash, nor the highest number of cases because not all crashes with tire problems might have been coded by the police.

[11] Based on the consistency in the overall numbers of tire problems in FARS during the past eight years, the agency has not deemed it necessary to update the injury numbers in the more intricate analysis of NASS–CDS data. We believe that there would be almost no change in the target population if a few more recent years, *e.g.*, 1999–2001, were included in the NASS–CDS analysis.

[12] SAE is an organization that develops voluntary standards for aerospace, automotive and other industries. Many of SAE's recommended practices are developed using technical information supplied by vehicle manufacturers and automotive test laboratories.

[13] Load percentages stated throughout this document, unless otherwise specified, are based on the sidewall maximum rated load.

certification requirements for retreaded pneumatic passenger car tires. Among other things, the standard requires retreaded passenger car tires to comply with the tubeless tire resistance to bead unseating and the tire strength requirements of FMVSS No. 109. FMVSS No. 117 also specifies requirements for casings to be used for retreading, and certification and labeling requirements.

FMVSS No. 119, *New pneumatic tires for vehicles other than passenger cars*, 49 CFR 571.119, specifies performance and labeling requirements for new pneumatic tires designed for highway use on multipurpose passenger vehicles, trucks, buses, trailers and motorcycles manufactured after 1948, and requires treadwear indicators in tires, and rim matching information concerning those tires. Under this standard, each tire must meet requirements that are qualitatively similar to those in FMVSS No. 109 for passenger car tires. The high speed performance test in this standard only applies to motorcycle tires and to non-speed-restricted tires of 14.5-inch nominal rim diameter or less marked load range A, B, C, or D. In addition, FMVSS No. 119 does not contain a resistance-to-bead unseating test.

A tire under FMVSS No. 119 is generally required to meet the performance requirements when mounted on any rim listed as suitable for its size designation in the publications, current at the time of the tire's manufacture, of the tire and rim associations that are listed in the standard. Further, the tire is required to meet the dimensional requirements when mounted on any such rim of the width listed in the load-inflation table s of this standard. In addition to the permanent marking for any non-matching listed rims, each tire manufacturer is required to attach to the tire, for the information of distributors, dealers and users, a label listing the designations of rims appropriate for use with the tire.

FMVSS No. 120, *Tire Selection and rims for motor vehicles other than passenger cars*, 49 CFR 571.120, requires that vehicles other than passenger cars equipped with pneumatic tires be equipped with rims that are listed by the tire manufacturer as suitable for use with those tires and that rims be labeled with certain information. It also requires that these vehicles shall be equipped with tires and rims that are adequate to support the vehicle's certified gross weight.

Tire selection under FMVSS No. 120 consists of two elements. With one exception, each vehicle must be equipped with tires that comply with FMVSS No. 119 and the load rating of those tires on each axle of the vehicle must together at least equal the gross axle weight rating (GAWR) for that axle. If the certification label lists more than one GAWR-tire combination for the axle, the sum of the tire's maximum load ratings must meet or exceed the GAWR that corresponds to the tire's size designation. If more than one combination is listed, but the size designation of the actual tires on the vehicle is not among those listed, then the sum of the load ratings must simply meet or exceed the lowest GAWR that does appear.

FMVSS No. 120 also contains a requirement related to the use of passenger car tires on vehicles other than passenger cars. The requirement states that when a tire that is subject to FMVSS No. 109 is installed on a multipurpose passenger vehicle, truck, bus, or trailer, the tire's load rating must be reduced by a factor of 1.10 by dividing by 1.10 before determining whether the tires on an axle are adequate for the GAWR. This 10 percent de-rating of P-metric tires provides a greater load reserve when these tires are installed on vehicles other than passenger cars. The reduction in the load rating is intended to provide a safety margin for the generally harsher treatment, such as heavier loading and possible off-road use, that passenger car tires receive when installed on a MPV, truck, bus or trailer, instead of on a passenger car.

FMVSS No. 129, *New non-pneumatic tires for passenger cars*, 49 CFR 571.129, includes definitions relevant to non-pneumatic tires and specifies performance requirements, testing procedures, and labeling requirements for these tires. To regulate performance, the standard contains performance requirements and tests related to physical dimensions, lateral strength, strength (in vertical loading), tire endurance, and high-speed performance. The performance requirements and tests in FMVSS No. 129 were based upon those contained in FMVSS No. 109.

III. Pre-TREAD Act Enactment Agency Response to Safety Problem

Prior to this rulemaking, NHTSA embarked on a program of global harmonization for light vehicle tire standards under the auspices of the United Nations/Economic Commission for Europe's (UN/ECE) World Forum for Harmonization of Vehicle Regulations (WP.29).[14] NHTSA, within the WP.29's Working Party on Brakes and Running Gear (GRRF),[15] had been working cooperatively with other countries to develop a global tire standard that could better assess the safety performance of modern tires.

Beginning in July 1999, the GRRF had been considering a draft global technical regulation (GTR) based on the Global Tire Standard 2000 for New Pneumatic Car Tires (GTS–2000),[16 17] an industry developed standard. Prior to the enactment of the TREAD Act, tentative consensus within an ad hoc tire harmonization working group of the GRRF concerning the draft GTR had been reached on the following issues: (1) to adopt the ECE R30 high speed test methodology (see **Note**) in place of the FMVSS No. 109 high speed test, (2) to keep the current FMVSS No. 109 resistance-to-bead unseating test until NHTSA develops an alternative that is more appropriate for radial tires, and (3) to develop an optional requirement for testing wet grip.

Note: The ECE Regulation 30 includes a single performance requirement, the high-speed test, which is conducted at a speed close to and up to the rated speed of the tire. The methodology used in ECE R30 and suggested by the tire industry in GTS–2000 for tire harmonization determines the test speed based on the tire's speed symbol rated speed. The following chart illustrates the rated speed in km/h for each speed symbol.

Speed symbol	Rated speed—km/h
F	80
G	90
J	100
K	110
L	120
M	130
N	140
P	150
Q	160
R	170
S	180
T	190

[14] Formerly, "Working Party on the Construction of Vehicles (WP.29)." The Forum's Web site is *http://www.unece.org/trans/main/welcwp29.htm.*

[15] The GRRF is a Working Party within WP.29 that is responsible for developing draft global technical regulations on brakes, tires, wheels, and other chassis components of motor vehicles.

[16 17] GTS–2000 would replace the current FMVSS No. 109 high-speed test with the high-speed test required by ECE—R30 (the European tire regulation for tires used on light passenger vehicles), including temporary spares. It would also limit the application of the other three tests currently required by FMVSS No. 109, namely the strength test, the bead unseating test, and the endurance test, to bias tires and low speed rated radial tires because industry believes that these three tests have relevance to bias and bias-belted tires, but little, if any, relevance to radial tires, with the single exception of the endurance test for low speed (160 km/h/99 mph, or less) radial tires.

Speed symbol	Rated speed—km/h
U	200
H	210
V	240
W	270
Y	300
ZR	>300

These speeds range from a minimum of 140 km/h (88 mph) to 300 km/h (188 mph) for W, Y categories. The total test time is 50 minutes. The inflation pressures for the ECE R30 high-speed test are typically much higher than those recommended by vehicle manufacturers for vehicle operation.

Other issues that had also been under discussion in the ad hoc group prior to the TREAD Act included: (a) the U.S.'s suggestion to lower the inflation pressures for and increase the duration of the high speed test (current ECE R30 test), (b) the U.S.'s suggestion to agree on the need for tire labeling requirements that are unique to the U.S., such as maximum inflation pressure, and UTQG consumer information, (c) the U.S.'s suggestion to identify requirements that should be included as optional requirements, (d) assigning to the UN the responsibility for tire plant code registration for a global standard, and (e) the U.S.'s suggestion to increase the ambient temperature for the high speed test.

In a February 2001 submission to the docket (Docket No. NHTSA–2000–8011), the Chairman of the GRRF Tire Harmonization Working Group had recommended on behalf of the GRRF that NHTSA adopt a draft text that reflects the current state of deliberations for developing a harmonized tire standard. At its 126th session in March 2002, WP.29 decided that there was little prospect of achieving global agreement at this stage and suspended further work indefinitely. The group, as its final task, submitted comments on the NPRM in this rulemaking. The U.S. representative to the GRRF recused himself from these deliberations.

IV. Post-TREAD Act Enactment Agency Response to Safety Problem

A. Tire Testing and Opening of Docket No. 2000–8011

Shortly after the enactment of the TREAD Act, the agency had initiated tire testing at Standards Testing Labs (STL) in November 2000 to evaluate the high-speed performance, endurance performance, and low inflation pressure performance of a limited number of current production tires. The agency had developed a test matrix which focused on the five main parameters currently used in tire testing under FMVSS Nos. 109 and 119: load, inflation pressure, speed, duration, and ambient temperature. Copies of the test matrix and testing results for P-metric tires and for LT tires have been available in the docket (*see* the Tire Test Matrix in NHTSA Docket No. 2000–8011–1).

In summary, the results of the high speed and endurance tests had indicated that the agency could develop and propose test requirements that were realistic in terms of the test parameters, yet more stringent than the current FMVSS No. 109, FMVSS No. 119 requirements, European Regulation ECE R 30, GTS 2000, and RMA 2000. The proposed test requirements had differentiated tires with better high speed and endurance performance from those with lesser performance. The low pressure validation tests had indicated that tires that were able to successfully complete the endurance testing could also complete an additional 90-minute test at a low inflation pressure, 140 kPa for P-metric tires, thus providing an adequate safeguard for consumers to take corrective action when the low pressure warning lamp proposed under the tire pressure monitoring system rulemaking is activated at a ''significantly'' under-inflated level.

In September 2000, NHTSA had opened a docket, NHTSA–2000–8011, titled ''Tire Testing—Federal Motor Vehicle Safety Standard (FMVSS No. 109).'' The purpose of this docket has been to collect tire test data and receive feedback on its high speed and endurance performance testing matrices. At issuance of the NPRM, comments and recommendations from 7 entities had been received in the docket. Additionally, Toyota Motor Company (Toyota) had submitted a copy of its air loss test procedure to the docket. Substantive comments and recommendations in response to NHTSA's testing matrices were discussed in the NPRM.

B. March 5, 2002, Notice of Proposed Rulemaking (NPRM)

As a result of the aforementioned testing and data collection efforts, the agency identified an array of amendments for revising and updating its tire standards and thereby improving tire performance in a NPRM published on March 5, 2002. Some of these amendments would have upgraded existing tests, while the others would have added new ones.

In the NPRM, the agency proposed to include the new tire performance requirements in Standard No. 139, a new tire standard established in a November 18, 2002 final rule on Tire Safety Information (Docket No. NHTSA–02–13678, 67 FR 69600, November 18, 2002). The standard applies to light vehicle tires. As used in the tire safety information final rule, ''light vehicles'' are vehicles (except motorcycles) with a gross vehicle weight rating (GVWR) of 10,000 pounds or less.

Under the NPRM, the new standard would have contained requirements and test procedures addressing the following aspects of tire performance: Tire dimension, high speed, endurance, road hazard impact, bead unseating, low inflation pressure performance, and aging effects.[18]

The proposed high speed and endurance tests would have replaced the current high speed and endurance tests in FMVSS No. 109, *New Pneumatic Tires—Passenger Cars,* 49 CFR 571.109, with a more stringent combination of testing parameters (ambient temperature, load, inflation pressure, speed, and duration.) Most significantly, the proposed high speed test would have specified test speeds (140, 150 and 160 km/h (87, 93, and 99 mph)) that are substantially higher than those currently specified in FMVSS No. 109 (120, 128, 136 km/h (75, 80, 85 mph)). Likewise, the proposed endurance test would have specified a test speed 50 percent faster (120 km/h (75 mph)) than that currently specified in FMVSS No. 109 (80km/h (50 mph)), as well as a duration 6 hours longer (40 hours total) than that currently specified in FMVSS No. 109 (34 hours total). At the specified test speed (120 km/h), the proposed endurance test distance (4800 km) would have been almost double the distance accumulated than under the current endurance test (2720 km at 80 km/h). These new testing parameters were based on NHTSA's activities undertaken in response to the TREAD Act, including extensive agency testing, data gathering and analyses as well as agency review of other existing international, industry and National standards and proposals, and submissions by the public.

The proposed road hazard impact test and the bead unseating test were modeled on SAE Recommended Practice J1981, *Road Hazard Impact Test for Wheel and Tire Assemblies (Passenger Car, Light Truck, and Multipurpose Vehicles)*, and the Toyota air loss test, respectively. These new tests would have replaced the strength and bead unseating resistance tests in the current FMVSS No. 109 with tests

[18] For the convenience of the reader, we have placed in the docket for today's final rule a document that shows how the recently promulgated tire safety information requirements (*see* Footnote # 1) and performance requirements appear together in FMVSS No. 139.

that were believed to be more real-world and stringent.

In addition to the tests cited above, the proposed standard would have contained tests for two new aspects of performance: Low inflation pressure performance and aging effects. By seeking to establish tests for these aspects of performance, the agency was attempting to address concerns raised by members of Congress in hearings preceding the enactment of the TREAD Act that NHTSA's current test requirements do not evaluate how well tires perform either when significantly underinflated or after being in use for several years and being subjected to environmental variables, such as heat. In particular, underinflation and heat were factors highlighted as contributing to failure of the Firestone ATX and Wilderness tires in the TREAD hearings, and in the agency's Firestone investigation (NHTSA Office of Defects Investigation (ODI) investigation number EA00–023).

To test low inflation pressure performance, the agency proposed two alternative tests based on agency testing and data analyses. Both tests would have evaluated tires when they are significantly under-inflated. For instance, 140 kPa (20 psi) for P-metric tires (the low inflation pressure threshold requirement for warning lamp activation in the proposed Tire Pressure Monitoring System (TPMS) standard, Docket No. NHTSA–00–8572 (66 FR 38982, July 26, 2001) would have been used as the ''inflation pressure'' testing parameter for standard load P-metric tires. To test for resistance to aging effects, the agency proposed three alternative tests that would have evaluated a tire's long term durability through methods different than and/or beyond those required by both the current and the proposed endurance test parameters. The three tests would have used peel strength testing, long-term durability endurance requirements, and oven aging, respectively. The agency solicited comments on which of the two proposed tests for addressing low inflation pressure performance, and which of the three tests proposed for addressing aging effects, should have been chosen for the new standard.

In addition to proposing test procedures for the new standard, the agency also discussed in this document its ongoing and future research plans on tire safety, and sought comments on the future use of shearography analysis (a method of analysis using laser technology) for evaluating the condition of tires subjected to the proposed testing procedures and the plans for revising the Uniform Tire Quality Grading Temperature Grading Requirement testing speeds so that they would have been consistent with the test speeds in the proposed high speed tests.

With regard to tire selection criteria and the de-rating of P-metric tires, the agency proposed retaining the de-rating percentage of 1.10 for P-metric tires used on non-passenger car vehicles and revising FMVSS No. 110 to require that the determination of vehicle normal load (''reserve load'') on the tire be based on 85% of the load at vehicle placard pressure.

Finally, the agency discussed revising FMVSS Nos. 110, *Tire selection and rims,* for passenger cars, 49 CFR 571.110, and 120, *Tire selection and rims for motor vehicles other than passenger cars,* 49 CFR 571.120, to reflect the applicability of the proposed light vehicle tire standard to vehicles up to 10,000 pounds GVWR, and revising FMVSS Nos. 117, *Retreaded pneumatic tires,* 49 CFR 571.117, and 129, *New non-pneumatic tires for passenger cars,* 49 CFR 571.129, to replace the performance tests which reference or mirror those in FMVSS No. 109 with those specified in the proposed new light vehicle tire standard.

Emphasizing that the agency was mindful of the principles for regulatory decisionmaking set forth in Executive Order 12866, Regulatory Planning and Review, and wished to adopt only those amendments that contribute to improved safety, NHTSA carefully examined the benefits and costs of these amendments. The agency noted that its efforts to do so, however, were limited by two factors: (1) The limited time allowed by the schedule specified in the TREAD Act for completing this rulemaking, and (2) the difficulty inherent in crash avoidance rulemakings, stemming from the multiplicity of the factors contributing to the occurrence of any crash and the difficulty of ascertaining the relative contribution of each factor, in linking specific improvements in safety requirements with specific reductions in crashes and resulting deaths and injuries.

The agency, based on the proposed high speed and endurance test, estimated that the benefits of this would have been 27 lives saved and 667 injuries reduced and emphasized that not all benefits could have been quantified, *e.g.*, benefits from the proposed aging test, the proposed low inflation pressure performance tests, the proposed road hazard and bead unseating tests, and aspects of the proposal that address the overloading of vehicles.

The agency estimated that about one-third (32.8 percent) of all tires would have needed improvements to pass the high speed and endurance tests and that the overall annual cost of these tests for new original equipment (64 million tires) and replacement tires (223 million tires) would have been estimated at $282 million for a total of 287 million tires sold annually and the net costs per equivalent life saved would have been about $7.2 million. The agency noted that it anticipated receiving cost data and other information that would enable it to refine its assessment of benefits and costs.

Expressing concern about the overall costs of the rulemaking and the net costs per equivalent life saved, the agency sought comments on the proposed new standard, including its applicability and test procedures, modifications to related existing standards, and lead time provided for manufacturers to achieve compliance.

C. Post-NPRM Technical Submissions to NHTSA Tire Upgrade Docket

1. NHTSA Testing at Standards Testing Labs (STL)

The agency conducted tire testing at Standards Testing Labs (STL) to evaluate the performance of tires tested to the high speed and endurance parameters proposed in the NPRM. The agency tested 20 (15 P-metric and 5 LT) current production tires.

For high speed testing, at an ambient temperature of 38° C, all 20 tires tested for a duration of 30 minutes at 140, 150, and 160 km/h with the proposed inflation pressures completed the test without failure. At an ambient temperature of 40° C with the other parameters being the same, all 15 P-metric tires completed the test without failure. For LT tires, 1 of 5 tires tested failed the high-speed test. Testing to these same conditions during Winter 2002 with 40 P-metric and 20 LT tires resulted in failures in 2 P-metric tires and 0 LT tires.

Endurance testing was conducted with the same parameters proposed in the NPRM—load combinations of 90/100/110 percent load, test speeds of 120 km/h, duration of 40 hours, ambient temperature of 40 C, and the inflation pressure of 180 kPa for P-metric tires and 75 percent of maximum inflation pressure for LT tires. Four of 15 tires failed to complete the test, representing a 27 percent failure rate. The same 15 tire brands were tested at the same parameters except the ambient temperature was reduced to 38° C and the loads were reduced to 85/90/100 percent. Under these conditions, 1 of the 15 tires failed to complete the test, representing a failure rate of 7 percent. The one failure was a ''Q'' speed-rated snow tire that completed the 40-hour duration but failed the post-inspection because of chunking.

For the 5 LT tires tested, 3 of the 5 completed the endurance tests at the proposed parameters, representing a 40 percent failure rate. When the load and ambient temperature were reduced to 85/90/100 percent and 38° C, respectively, all 5 LT tires completed the test without any failures.

The agency also conducted low pressure testing at Smithers Scientific to evaluate Alternative 2 of the proposed low pressure test on the performance of 13 tires (10 P-metric and 3 LT).[19] The proposed 40-hour endurance test was performed on the tires before they were run to the low pressure test. The low pressure test parameters included an inflation pressure of 140 kPa, a speed of 140, 150, 160 km/h, a duration of 90 minutes (30 minutes at each test speed), a 67 percent load. The same tests were performed using 3 LT tires, but at inflation values of 260/340/410 kPa for load ranges C/D/E, respectively. These inflation pressure values represent the lowest inflation pressure provided by tire industry standardizing bodies for a tire load limit.

One of the P-metric tires failed to complete the endurance test and, therefore, was not tested to the low pressure test. The 12 remaining tires tested completed the 90-minute low inflation test without failure.

2. Rubber Manufacturer's Association (RMA) Design of Experiment (DOE) and Confirmation Testing

Members of the RMA developed a response surface model Design of Experiment (DOE) to assess tire temperatures versus test conditions (inflation pressure, load, and speed), surface type (standard test wheel of 1.7-m diameter versus a flat surface), and ambient temperature. An additional follow-up confirmation round of testing, which contained a broader range of tire types and sizes, was also conducted by RMA.[20]

RMA tested P-metric and LT tires to a matrix of high speed and endurance tests. Seven (4 P-metric and 3 LT) tire sizes of various brands were included in the test protocol. P-metric tires included P235/75R15 for all season, P215/70R15 for standard load ''broad line,'' P265/75R16 for all terrain, and P215/70R15 for snow. For LT tires, the sizes were LT245/75R16 LRE for all-terrain/all-traction, LT 235/85R16 LRE for all season, and 31 x 10.5 R 15 LRC for mud. A total of 145 tires were tested.

The parameters RMA used for its high speed testing for P-metric tires were identical to the agency's, except for the ambient temperature. For LT tires, RMA's test parameters were 10 km/h lower than the agency's proposal for speed (130, 140, 150 km/h), and higher for inflation pressures at 330 and 520 kPa for load ranges C and E tires, respectively. All 42 P-metric tires tested to RMA's proposal completed the 160 km/h step without any failures. Of the 32 LT tires tested, 1 tire failed to complete the 150-km/h step, representing a 3 percent failure rate, and 2 LT tires failed to complete the 160 km/h speed step, a 6 percent failure rate.

For its endurance test parameters for P-metric tires, RMA utilized an ambient temperature at 38° C, a load at 85/90/100 percent of the maximum load rating, the same test speed proposed in the NPRM (120 km/h) and duration at 34 hours. For LT tires, RMA's testing included the same parameters as those for P-metric tires except it utilized a lower test speed of 110 km/h and higher inflation pressures at 285 and 445 kPa for load ranges C and E tires, respectively. For the 30 P-metric tires tested to RMA's endurance test, 2 failed to complete the 100 percent load step (5 percent failure rate). For LT tires, 2 of 32 tires tested failed to complete the 100 percent load step (6 percent failure rate).

The outline of RMA's DOE text matrix, including specific test conditions applied by tire type, as well as a full set of DOE tables, charts, graphs, and data are included as DOE Attachment II to RMA's comments (Docket No. 2000–8011–64).

According to RMA, tires included in the test matrix were selected to cover the appropriate range of technical parameters and to ensure representative high volume in the marketplace. The three ''popular'' tire sizes chosen by RMA were: (1) P205/65R15, (2) P235/75R15, and (3) LT245/75R16 LRC/LRE. Most of the tires tested by RMA, particularly those used for the confirmation testing, were at the lower end of the speed rating scale, *e.g.* ''Q'' through ''S'' and included snow tires, which represent a small percent of sales of replacement tires in the U.S. A brief summary of RMA's DOE conclusions and recommendations are briefly discussed below. RMA's recommendations and comments on the NPRM proposals are summarized in the following section of this document.

In summary, the RMA concluded from the DOE and confirmation test results that:

(1) Speed is the most dominant test parameter. Larger temperature increases are observed when speed is increased compared to changing inflation pressure or load, particularly on a test wheel. According to the DOE, at 80 km/h the average tire temperature is 2° C higher on a 1.7 m test wheel than a flat surface, at 160 km/h the curved surface is 25° C higher.

(2) Passenger car and light truck tires require different test conditions on a test wheel, particularly for speed, to achieve comparable levels of severity. The effect of this curved surface of the 1.7 m test wheel is to increase the tire deflection compared to a flat surface. In addition, the combination of the curvature of the tire and reverse curvature of the test wheel results in the footprint of the tire being altered. The footprint shape is altered in a non-representative manner when compared to a flat surface. This altered deflection and footprint area result in substantially higher stresses. This is demonstrated by the higher tire temperatures on a curved versus flat surface.

(3) The effect of the test wheel curvature increases substantially with speed. Standing waves, which lead to early tire failure, occur at speeds 10 to 20 km/h lower on a curved surface compared to flat. To have a realistic test that can be related to real-world conditions, it is important to properly adjust test conditions on a curved surface to as closely as possible match those of a flat surface.

3. Ford Motor Company (Ford) Tire Aging Analysis

In June 2002, Ford presented its analysis on the effectiveness of the aging protocols proposed by NHTSA for FMVSS No. 139. Ford's presentation was comprised of evaluated results obtained from tire investigations and data analysis from experiments based on

[19] The agency did not re-test any tires to Alternative 1 of the low pressure endurance performance test since earlier testing (in Spring 2001) of 24 tires that completed a more stringent endurance test (50 hours and loads of 100/110/115 percent indicated no failures.

[20] An additional follow-up confirmation round of testing, containing a broader range of tire types and sizes, was conducted to validate the results of the DOE. RMA ran a matrix of passenger and light truck tires on high speed (increasing speed in 10 km/h steps to failure) and endurance (increasing load in 10% steps to failure). Seven high-volume, representative tire sizes of various brands were included in the test protocol (4 passenger and 3 light truck). Each tire size was tested for high speed and endurance; a total of 145 tires were tested. Passenger tire sizes tested included: P235/75R15 for economy all-season; P215/70R15 for standard load ''broad-line''; P265/75R16 for all-terrain; and, P215/70R15 for snow. The light truck sizes tested included: LT245/75R16 LRE for all-terrain/all-traction; LT235/85R16 LRE for all-season; and, 31 x 10.5 R15 LRC for mud.

the parameters discussed in the Notice. Based on the results from these experiments, Ford recommended aging mounted tires with a 50/50 blend of oxygen/nitrogen in an oven for two weeks followed by a peel test to be performed on the tire. They also suggested that it would be more appropriate to test the endurance, high speed, or low pressure performance of a tire aged in this manner.

Ford's observations and conclusions are summarized below:

Results Obtained From Tire Investigations: (1) There is a very strong correlation between cross-link density and peel strength for all of the manufacturing facilities, (2) peel strength decreases exponentially as, over time, cross-link density increases (as cross-link density increases, the elongation at break decreases), (3) since there is a relationship between cross-link density and peel strength, and also a relationship between peel strength and age of the tire, a relationship between cross-link density and age of the tire should also exist, (4) the evidence that cross-link density exponentially increases over time suggests that skim and wedge rubber is aging oxidatively, and (5) the aging mechanism of spare tires is the same as road tires, oxidative.

Results From NHTSA ODI Report on Firestone Wilderness AT Tires: (1) The overwhelming majority of tires analyzed aged oxidatively in the field and oxidative aging is the predominant mechanism in the reduction of peel strength over time.

Adhesion (Peel) Test: (1) Although peel testing is an important characteristic of tires, the data for Alternative 1 do not support the use of endurance testing as an appropriate aging condition for the tire because the test procedure does not influence the peel strength to any significant degree, *i.e.*, after 24 hours of testing, only a 10% decline in peel strength is affected, while after 50 hours, a 16.8% decrease is measured, (2) the cross-link density of the skim rubber becomes lower as a result of the conditions at which the endurance test is run and this indicates that anaerobic aging due to severe heat and stress is degrading the rubber properties, (3) field aged tires increase in cross-link density with time, not decrease, (4) the wedge properties of the endurance tested tires also show anaerobic aging and this data shows that significant anaerobic aging occurs during endurance testing of this tire, (5) the field data obtained by both NHTSA and Ford suggest aerobic/oxidative aging.

Michelin's Long-Term Durability Endurance Test: (1) The test is not an appropriate universal aging test because it does not properly age the wedge region of larger tires or tires with a heavier tread mass (in the late 1970s and early 1980s when this test was first developed, tread patterns were more all season than all terrain and the average tire size was smaller), (2) the dynamic aspect of the test is too benign for the nearly 10.5 days of test wheel time required (for passenger car tires, running the tire slightly overloaded (11%) and significantly overinflated (17%—significant because inflation pressure changes have a more pronounced effect than load changes in test wheel tests) at 97 km/h essentially prolongs the test so that oxidative aging can occur but fails to test the belt package in any meaningful way once it is aged), (3) the test is not without merit; the 50/50 oxygen/nitrogen blend does accelerate the oxidative aging mechanism of skim rubber.

Oven Aging: (1) Oven aging tires, either un-mounted or mounted with air, has very little effect on the chemical and physical properties of the belt package rubber; only when mounted with the 50/50 blend do properties significantly change, (2) it is possible, by using the 50/50 oxygen/nitrogen blend, to artificially age tire rubber to the chemical equivalent of 3–4 years in age and, from a chemical aging standpoint, properties of the skim rubber can be aged just as effectively in an oven using the 50/50 oxygen/nitrogen blend as on the test wheel, (3) for oven aging, the wedge rubber ages similar to field-aged tires; contrasting with tires run to the "Michelin" test, which showed severe reversion in the wedge rubber, (4) tires oven aged with the 50/50 oxygen/nitrogen blend are in a condition similar to an older full size spare and, therefore, it may be more appropriate to test the endurance, high speed, or low pressure performance of a tire aged in this manner.

Ford also submitted aging testing results, as well as data regarding the high speed, endurance and low-pressure test. Ford's data have been granted confidential status. Therefore, it is not available for review in the docket. Their recommendations from their high-speed, endurance and low-pressure testing are summarized in the comment summary section of this document.

4. Goodyear Endurance Testing

In a August 2002 presentation to NHTSA and submission to the docket, Goodyear provided the following comments on NHTSA's proposed endurance test based on additional testing conducted by Goodyear: (1) Heat induced damage mode (tread chunking) exhibited in proposed FMVSS No. 139 endurance testing is not representative of real world failures in the field, (2) tires with proven safe field performance will not pass the proposed FMVSS No. 139 due to tread chunking caused by excessive heat build-up due to high speed on curved surface and high load conditions, and (3) tire design changes/compromises to reduce heat induced tread chunking will negatively impact other safety performance characteristics (*e.g.*, wet traction, wet handling, dry traction).

Based on the aforementioned observations, Goodyear concluded that (1) FMVSS No. 139 on a 1.7m curved surface causes shorter footprint length, high footprint pressures and elevated strain energy resulting in higher tire running temperatures, (2) 65 mph with a 10% load reduction on a 1.7m test wheel yields tire temperatures equivalent to FMVSS No. 139 conditions on a flat surface, (3) a tire that did not pass the FMVSS No. 139 test on a 1.7m test wheel due to tread chunking passed when the test was duplicated on a flat surface.

Goodyear stated that it agrees with the agency the test speed needs to be 75 mph on a flat surface but suggests the following revision to the proposal to correlate the speed to an equivalent speed and load on a 1.7m curved surface: (1) Reduce the load by 10% to 100% at the final load step to effect a 8° F (4.4° C) reduction in the shoulder surface temperature, and (2) reduce the speed 10 mph, to 65 mph, to effect an 9° F (5° C) reduction in shoulder surface temperature. According to Goodyear, the reduced load and speed parameters would reduce heat induced chunking.

V. Summary of Public Comments on NPRM

NHTSA received over 5,000 comments on the March 2002 NPRM. The comments were submitted by: vehicle and tire manufacturers and associations, consumer advocacy organizations and individual members of the public. Substantive comments are summarized below.

A. NHTSA's Proposed Test Procedures

1. High Speed Test

RMA agreed with NHTSA's proposed conditions for passenger tires but believed that adjustments in speed and inflation pressure are necessary for light truck tires to achieve a similar degree of severity as proposed for passenger tires.

ITRA supported the proposal made by the RMA and stated that NHTSA's proposed high speed tests results generally show heat precipitated tread chunking as opposed to tread separation.

GRRF, JATMA, and ETRTO urged the Agency to adopt the high speed test program as specified in the draft Global Technical Regulation (GTR) submitted to the Agency by the *ad-hoc* group of WP29/GRRF.

Ford agreed with the agency's position that the current high speed test procedure should be upgraded.

Advocates supported the agency's selection of test speed increments, ambient temperature, inflation pressure, load, and duration with regard to NHTSA's proposed single minimum requirement to be met by all tires.

CU recommended all tires be speed rated and then tested according to the RMA 2000 procedure because the RMA 2000 procedure follows GTS 2000 closely and would provide greater promise for reaching global harmonization than the proposed FMVSS No. 139 test. CU, however, believed that ambient temperature testing conditions, as specified by RMA 2000, should be raised to 40° C to equal typical daytime temperatures in the southern regions of the U.S. during the summer.

RMA, ETRTO, GRRF, and JATMA stated that the temperature increase from 38° C to 40° C will create considerable complexity to the industry since most other tests are run at 38° C and suggest retaining 38° C as the ambient temperature for all tests. PC supported the agency's modification of the temperature parameters in order to better simulate real world conditions.

Ford recommended that the test be conducted at the maximum rated load (105% of the maximum rated load) for the tire and not the 85% condition so that tires would be tested at loads consistent with the critical stress conditions for the tire. GRRF stated that the load percentage used for testing should reflect the vehicle normal load condition but also take into account the effect of the curvature of the test drum. ITRA/TANA commended NHTSA for reducing the load in the parameters of the high speed test from 88% to 85%. CU supported the change in load if the proposed high speed methodology is adopted and stated that it will be beneficial for LT tires to be testing with same load conditions so that light trucks would also have the same reserve load under normal loading conditions.

GRRF stated that testing on a drum at the lower inflation pressures specified in the NPRM will result in an increase in stress in areas of the tire not usually subject to such high stress levels and may result in some tires having to be ''stiffened'' by having a greater amount of material in these areas simply to pass the test. RMA stated that the proposal results in more overload (or over-deflection) in light truck tires compared to passenger tires and suggested the following test pressures: LT load range C: 330 kPa; LT load range D: 425 kPa; LT load range E: 520 kPa. Ford suggested testing at various inflation pressures to reflect a wider range of conditions to which tires may be exposed: P-metric 35, 32, 29 psi (241, 220, 200 kPa), Extra Load P-metric 42, 38, 34 psi (290, 262, 234 kPa), LT load range C 50, 46, 42 psi (345, 317, 290 kPa), LT load range D 65, 60, 55 psi (448, 414, 379 kPa), LT load Range E 80, 73, 66 psi (552, 503, 455 kPa). Public Citizen supported the proposed inflation pressures for the high-speed test.

GRRF, Ford, RMA, PC, and Advocates believed the test should be replaced with a procedure based on the rated speed capability of the tire. They felt that the road safety interests of the consumer would be better met by using speed values during the high speed test that take into account the speed capability of the tire and the designed maximum speed of the vehicle to which it may be fitted. In lieu of a speed-rating regime, RMA suggested speed steps of 130/140/150 km/h for light truck tires stating the change in predicted running temperature from a flat surface to a 1.7-m test wheel is different for passenger and light truck tires and, therefore, a reduction of 10 km/h in the test speeds for light truck tires to compensate for this effect and maintain a change in severity from flat to test wheel similar to passenger tires is needed.

GRRF stated that a test duration step of 10 minutes has been found to be acceptable in achieving temperature equilibrium and that the intermediate speed step duration is less relevant than the duration at the chosen final speed. CU agreed with NHTSA that the ten-minute speed steps used in RMA 2000 are too short to evaluate high-speed capability.

2. Endurance Test

ETRTO and GRRF stated that failure mode reached during the test might not reflect real world tire failure mode because of the deflection of the tire on the test wheel.

RMA and ITRA/TANA suggested an alternative test protocol that: (1) Reduces load from 110 to 100%; (2) reduces duration from 40 to 34 hours in 4/6/24-hour steps; (3) adjusts light truck tire inflation pressure from 75% of maximum to 81.8% of maximum to reflect a proportional load capacity as shown in the TRA light truck load tables; (4) adjusts light truck tire speed from 120 km/h to 110 km/h to maintain comparable severity from flat to test wheel similar to passenger tires; and, (5) reduces ambient temperature from 40° C to 38° C. RMA stated that for light truck tires, this alternative test proposal adjusts the test conditions to be more equivalent to the tire temperatures that would be produced on a flat surface for the specified test conditions.

GRRF suggested that consideration should be given to combining the proposed endurance and aging tests in order to eliminate unnecessary testing.

CU and Advocates supported the proposed parameters.

GRRF, RMA, and JATMA stated that the test ambient temperature should be 38 ± 3° C so the existing equipments can be used without any change. Advocates agreed with the agency that 40° C is a more realistic selection based on the ambient operating temperatures in the southern part of the U.S. and Public Citizen supported the agency's modification of the temperature parameters in order to better simulate real world conditions.

RMA suggested testing at 85/90/100 percent of maximum load for P-metric and light truck tires and argue that the tires in the proposed test are significantly over-deflected (40 to 36%) during the last load/time step of 22 hours. Advocates stated that given the excessive loading of larger light trucks, those usually having GVWR greater than 6,000 pounds, it supports the more demanding alternative discussed by NHTSA. PC stated that NHTSA should adopt load specifications of 100, 110 and 115 percent to adequately provide for the loading conditions of these heavier commercial vehicles over 6,000 GVWR.

RMA suggested an adjustment in inflation pressure for LT tires from 75% to 81.8%, following the respective load/pressure formulas for passenger and light truck tires as defined by the TRA. According to RMA, this reflects a load capacity difference between passenger and light truck tires at the same percent pressure. ITRA/TANA stated that LT tires with heavier casing construction should be tested at pressures not less than 80 percent of their maximum inflation pressure because their designs generate a much higher temperature than P-metric tires when conducted on a curved test wheel in a lab instead of a flat road surface. Advocates supported the inflation parameters.

RMA believed that the increase in speed is the most significant change to the endurance test and states that the speed increase from 80 to 120 km/h produces an average increase of 30° C in tire temperatures for P-metric tires over FMVSS No. 109 and an average increase of 40° C for LT tires. RMA suggested a reduction of 10 km/h for the LT tire test speed in order to maintain the same relative severity from flat to test wheel as that which occurs with passenger tires. Ford stated that increasing the test speed from 50 mph (80 km/h) to 75 mph (120 km/h) causes reversion in the tire and is not representative of real world tire performance.

Ford suggested that the agency adopt the current endurance test protocols as defined in FMVSS No. 109 for a period of 48 hours at the end of the current protocol and that FMVSS No. 119 be modified to include an additional test step at 130% rated load. Ford stated that their data indicate that tires with marginal sidewall designs will have difficulty passing this added test step. Advocates and PC supported the 40 hours duration as being a sufficiently stringent test.

3. Low Inflation Pressure Performance

a. Generally

GRRF, ETRTO, the Alliance, and JATMA asserted that the proposed endurance and high-speed tests obviate the need for a low inflation pressure test.

GRRF, JATMA, ETRTO, and ITRA/TANA opposed to the establishment of 140 kPa as an acceptable level of inflation pressure at which to carry out a low inflation pressure test. GRRF stated that the use of inflation pressures as low as 140 kPa (20 psi) for the proposed low pressure test, taking into account the drum and the duration of the test, will result in testing at abuse levels well outside any that could be reasonably expected to be taken into account in tire design and are outside operating recommendations given by the tire industry.

RMA stated that the low-pressure test should be run at 90% of the tire's maximum load capacity rather than 100% so that 20 psi is not 42% below the required test load but at 30%, the maximum allowed under the TPMS final rule.

The Alliance and Ford stated the low-pressure testing protocols, proposed in the notice, are not representative of real world aging conditions because the 40-hour endurance test preceding the low-pressure tests causes the belt region to age anaerobically. Results from these tests showed a tremendous heat build up in the tire which leads to tread chunking, a benign failure mode rarely if ever seen outside of a racetrack. They stated that it would be better to run a low-pressure test on a tire that had gone through an aging procedure that correlates to actual field aging of tires.

CU stated that the NPRM does not provide enough information to determine when exactly the tire would be run to the low-pressure conditions following successful completion of the endurance test. They recommended that the tire be allowed to cool down for a minimum of three hours at the ambient test condition before starting the low-pressure test.

b. Low Inflation Endurance

RMA, ITRA and TANA favored Option 1 stating that the Option 2 conditions are so severe that the tires experience thermal runaway (*i.e.,* the temperature did not stabilize within 30 minutes) during the required steps. RMA recommended a modified Option 1 test with adjusted test conditions which they state more accurately reflect performance on the flat surface and to more closely reflect the conditions that should exist when the TPMS warning is given: (1) Lowers LT tire speed from 120 to 110 km/h to maintain consistency with the RMA proposed endurance test conditions; (2) reduces the test load from 100 to 90% of the tire's maximum load capacity to reasonably simulate the effect of a 30% decrease in inflation pressure when the test pressure is specified at the minimum pressure listed in the NPRM at paragraph S6.4.1.1.1; and, (3) extends the time from 15 minutes to one hour for post-test measurement of inflation pressure.

CU favored an endurance type TPMS low pressure test over the high speed version proposed because they believe it is more representative of conditions consumers are likely to encounter. However, CU believed that testing the tires for 90 minutes at 75 mph represents too short a distance (just 112.5 miles) and is well below the typical fuel range of most vehicles. CU recommends that the test duration be at least four hours at 75 mph, simulating a distance of 300 miles and is more representative of the fuel range of a typical vehicle.

Advocates regarded this alternative as undemanding and insufficient for determining the underinflation tolerance of current light vehicle tires. Public Citizens believed that the stringency of the test is highly questionable considering that all of the tires tested passed the test.

c. Low Inflation High Speed

GRRF noted surprise that a test load of only 67% is quoted because it seems impractical for a consumer to reduce the vehicle load following a TPMS warning indication.

JATMA stated that this test is unjustified to demand tire performance of this type because consumers would not continue driving at above 140 km/h for over one hour with a tire pressure warning.

Ford supported the low-pressure high-speed test if the tires are aged in an oven with a 50/50 blend of oxygen and nitrogen and an allowance is made for a 2-hour break-in period at 180 kPa and 120 km/h at 85% load, similar to the FMVSS No. 109 high-speed test. Ford stated that the aging process and test protocol more closely approximates a full size spare that is put into service after 3–4 years: oxidatively aged and potentially under-inflated. The break-in period would give the aged tire an opportunity to be worked before being deflated and run to the low pressure test procedure and does not cause reversion in wedge rubber of the tire.

Advocates and PC supported the parameters of this test. However, Advocates regarded a 67 percent load as completely unrealistic and recommends that the agency consider raising the loading percentage for the low pressure/high speed test from 67 percent to 100 or 110 percent.

4. Road Hazard Impact

RMA stated the current FMVSS No. 109 plunger test should remain only for bias ply tires because radial tires are not susceptible to the type of failure that the current plunger tests was designed to prevent.

RMA, GM, the Alliance, ETRTO, and GRRF stated that the SAE J1981 test was developed as a wheel damage test, to test a wheels ability to withstand potholes and other anomalies, and has very limited use or experience within the industry as a tire test and significant work will be required to develop it into a tire test. RMA, ITRA/TANA, JATMA, GM, Alliance, and Advocates stated that a road hazard test, if NHTSA feels it is necessary, should be deferred for further study and research and to not be included in the proposed FMVSS No. 139.

Ford, the Alliance, and CU recommended that the agency retain the current test and Ford and CU suggest that the agency augment the stringency of the test. Ford stated that it currently uses twice the value specified in FMVSS No. 109 as a corporate specification for their tire suppliers and this level provides a reasonable indication that radial tires will exhibit good resistance to rock inducted tread damage.

Advocates, PC, and CU stated that NHTSA needs to explore other methods using more sophisticated means of evaluation, *e.g.,* shearography, for damage. GM noted that any anomaly from the pendulum impacts in its testing was undetectable by visual inspection.

5. Bead Unseating

RMA and GRRF believed that a bead-unseating test is unnecessary for radial tires. RMA, and ITRA/TANA suggested that if a bead unseating test must be maintained, then the current test be retained rather than adopting a completely new test. However, they believed that it does need to be modified to take into account the aspect ratio of tires. ITRA and TANA asked that retread tires be exempt from the proposed tests because the bead of the tire is part of the original casing and is not altered in the retreading process, and, as such, there would be redundancy in testing the original casings.

GRRF, Toyota, the Alliance, CU, and Ford stated that the introduction of this revised test without further validation would seem to be premature at this stage. They asserted concerns regarding the lack of a fully defined procedure, the specification of the test equipment, the costs of equipment, and the availability of suitable equipment on the open market. Several commenters, including Toyota, Ford, and the Alliance, asserted that there are significant differences between the agency's proposal and Toyota's test and/or certain specifications that need refinement, such as the load values, specifications for the test wheel/rim, inflation pressures, test device methods, and lateral force.

PC and Advocates supported the agency's proposal for the air loss bench test method because the test is independent of vehicle type but do not support the 200 millimeters per second as being satisfactory because they say it reveals nothing about how a tire would perform in a skid when the vehicle encounters either a pothole or a raised fixed object on the roadside applying an extremely rapid lateral, peak load to the tire. Advocates, however, questioned whether the test advances tire safety if all current production tires would pass the test.

6. Aging Effects

a. Generally

RMA and ITRA/TANA stated that none of the options in the NPRM are accepted industry tests with a proven relationship to actual tire performance. RMA and GRRF added that any aging test would be redundant in light of the revised high-speed and endurance tests plus a new low-pressure test.

The Alliance and ETRTO stated that the three test options proposed artificially decay of the materials in the tire structure, but those decays do not reflect what occurs in ''real life'' over a long period of service.

Ford stated that the predominant factor for tire aging in normal service is aerobic/oxidative aging, which may be accelerated by heat and cites to the NHTSA Office of Defects Investigation (ODI) Engineering Analysis Report on Firestone tires in support of this statement. Ford and the Alliance stated that the proposed tests do not appear to age the tire aerobically/oxidatively. Ford recommended aging mounted tires with a 50/50 blend of oxygen/nitrogen in an oven 70° C for 2 weeks. After this oven aging, they recommend a peel test be performed on the tire and suggest that it may be more appropriate to test the endurance, high speed, or low-pressure performance of a tire aged in this manner.

ITRA/TANA argued that retreads should be exempt from this test.

PC and Advocates asserted that shearographic analysis is critical in accurately determining aging test compliance.

Consumers Union believed further investigation of a more suitable procedure is needed.

b. Adhesion (Peel) Test

RMA stated that the proposed adhesion peel force test is the least appropriate option due to the following reasons: (1) ASTM–D413 is a peel adhesion test used in the industry to monitor trends and detect large shifts in historic levels and, under the best scenario for minimizing variability, has a 16.8% inherent variability, (2) the test is evaluating only a component of the tire, not the tire's overall performance, (3) peel force does not correlate with field performance, or, at a minimum, a recognized industry test wheel test—the peel adhesion test is not a separation-initiating test, it relates only to propagation (4) there is a lack of mechanical and chemical interaction as would occur in actual field.

GRRF and JATMA opposed this test stating that the proposals do not specify which of the several interfaces of the belt construction are to be tested.

ETRTO stated that the ASTM method is known by the industry to evaluate the vulcanized cord ply, not cut specimens from the tire.

CU believed that the peel test is not sufficiently repeatable or precise and urged NHTSA to conduct more research to develop a practical and efficient method of testing the effects of tire aging.

c. Michelin's Long Term Durability

RMA, JATMA, GRRF, and CU did not support this test because of its length and inherent cost.

ETRTO and JATMA stated that the use of pure oxygen for inflating tires, presents a danger of explosion and requires special safety procedures to be implemented in the laboratories.

JATMA stated that the test ambient temperature should be 38 ± 3° C so existing equipments can be used without any change. JATMA also states that the NHTSA test criterion that no reduction of inflation pressure from initial test pressure is not possible because O_2 is consumed during the test.

PC supported this test as a starting point for the proposed aging test.

d. Oven Aging

ETRTO asserted that this test will cause an extended vulcanization of all rubber components inside a tire and does not represent ''real world'' service conditions where the area subjected to heating and to repeated stresses is that inside the edges of the tread area.

RMA, ITRA/TANA, and GRRF believed this test is a more valid measure of tire performance than Option 1 and significantly less onerous than Option 2. RMA recommended the following modifications if the agency chooses to pursue this test: (1) lower the aging temperature from 75 to 70° C. 70° C is an industry standard for aging of rubber compounds and used by some companies for aging of tires prior to test, and (2) adopt the ambient temperature, inflation pressures, and speed from the RMA recommended endurance tests with steps of: (a) 4 hours at 85% load, (b) 6 hours at 90% load, (c) 14 hours at 100% load.

JATMA stated that a 15-day test is not suitable for mass production management. JATMA further states that the test ambient temperature should be 38 ± 3° C so the existing equipments can be used without any change.

CU stated that this procedure does not resemble what consumers experience in the real world with tire aging. In real world conditions, tires do not heat up evenly, and it is often the hot spots and dynamic flexing that define the weak link in tire design.

B. Application of New Standard/Deletion of FMVSS No. 109

RMA and TRA recommended that the proposed FMVSS No. 139 apply to new pneumatic radial tires on powered motor vehicles (other than motorcycles) that have a gross vehicle weight rating (GVWR) of 10,000 pounds or less and that were manufactured after 1975 and that tires designed for severe snow conditions, speed restricted tires, various trailer tires for special use, temporary service spare tires, and all bias tires should be excluded from FMVSS No. 139 and continue to be certified under existing FMVSS Nos. 109 and 119. RMA suggests that, under FMVSS No. 139, a passenger tire should be defined as one intended for normal highway service and its size designation typically shown as ''P'' metric or ''Hard'' metric and a light truck tire should be defined as one intended for normal highway service and its size designation includes ''LT'' and is load range ''C'', ''D'', or ''E''. JATMA requests that performance requirements for deep tread depth snow tires be stipulated apart from FMVSS No. 139 because of their special usage and design characteristics, *e.g.,* deep grooved tread.

JATMA and GRRF stated that the tire size designation, in addition to the load range, should be clearly stipulated for LT tires. GRRF stated that depending on tire size, some high load capacity LT tires correspond to a gross vehicle mass greater than 10,000 lbs.

SEMA, ITRA/TANA, Denman and Specialty Tires requested that limited-production specialty radial and bias-ply tires remain subject to the current testing procedures of FMVSS Nos. 109 and 119 because (1) tires manufactured in limited production do not present a general safety issue; (2) limited production specialty bias-ply tires cannot meet the standard of proposed FMVSS No. 139 and will be unfairly outlawed; (3) the potential cost for small businesses to otherwise comply with these rules would not be justified; and (4) NHTSA testing procedures and requirements result from the testing and analysis of solely radial tires.

C. Modification of Application of FMVSS Nos. 110 and 120

AIAM believed that NHTSA inadvertently proposed a prohibition on the use of Load Range E tires on vehicles exceeding 10,000 lbs. GVWR by, in S5.1.1 of FMVSS 120, requiring each vehicle to be equipped with tires complying with FMVSS No. 119. AIAM recommends that NHTSA revise S5.1.1 of FMVSS 120 to permit the installation of tires meeting the requirements set forth in FMVSS No. 139 and the rims listed in accordance with FMVSS No. 139 on vehicles exceeding 10,000 lbs. GVWR, as long as the tire load rating is not exceeded.

D. Modification to FMVSS Nos. 117 and 129

ITRA/TANA recommended that retreaded tires not be subjected to the proposed road hazard and bead unseating tests because the retread process does not affect the structure of an original casing and it is redundant to test a casing twice.

GRRF stated that principle of requiring retread tires to meet the same performance requirements as new tires is followed in the United Nations ECE Regulations 108 and 109 for car and truck retread tires, respectively.

E. De-Rating of P-metric Tires/Tire Selection/Load Reserve

RMA and GRRF supported NHTSA's retention of the 1.10 load service factor used to reduce the load rating of passenger car tires when installed on an MPV, truck, bus, or trailer, as specified in Part 571.110 Paragraph S4.2.2.2 of the proposed rule. RMA believed that this reduction in load rating is necessary for the reasons stated by NHTSA and is also appropriate to reduce the load rating for passenger car tires used on light trucks, vans, SUVs, and trailers for the following reasons: (1) higher stress on the tire due to the higher center of gravity of these vehicles; (2) more severe service conditions as compared to passenger cars; (3) greater potential for overload due to open cargo areas and increased likelihood for towing; and (4) more tire related problems on light trucks, SUVs, and vans.

RMA and GRRF stated that selection based on vehicle normal load not exceeding 88% of the tire maximum load would reduce the potential for overloading of tires.

GM recommended that the tire selection criteria not be linked to the load used in the high-speed test.[21]

The Alliance, AIAM, Subaru, Honda, and GM strongly recommended that the tire selection criteria in the proposed standard be modified as follows: (1) De-rating of the tire load capacity by dividing by 1.10 be applied only when comparing the GAWR with the vehicle maximum load and not on the vehicle normal load on tire for passenger car tires used on MPVs and light trucks; and (2) for vehicle normal load on a tire, even when passenger car tires are used on MPVs and light trucks, use 88% of the maximum load rating of the tire as marked on the sidewall. These vehicle manufacturers asserted that a lack of attention to the influence on vehicle design could lead to potentially serious unintended consequences (*e.g.*, increasing tire size beyond the need to provide adequate load capacity could raise the center of gravity of the vehicle, which may adversely affect it handling and stability and increase the likelihood of rollovers in some situations).

Ford agreed with the agency that tire robustness could be increased through additional load margin in the application or rating of tires. Ford recommended that the agency require tires to be tested at 105% of their rated load for all vehicle applications 10,000 lbs. GVWR and below. They believed that this additional 5% reserve capability at the maximum rated load condition would provide increased robustness for tire application on all vehicles, not only in OE applications.

PC and Advocates commended the agency for requiring LT tires to provide for a reserve load. However, they believe that a 15 percent load specification does not adequately account for the typical loading conditions for the range of these vehicles. PC recommends that the agency require between an 18 and 20 percent reserve load for vehicles that exceed the 6000 lbs. GVWR. Advocates urged the agency to consider a reserve figure of 18 percent for all light trucks or, in the alternative, a reserve figure of 18 percent for those from 6,001 to 10,000 pounds GVWR.

F. Lead Time

RMA, ETRTO, JATMA, and GRRF stated that it would not be possible to comply with effective dates of September 1, 2003, for passenger car tires, and September 1, 2004, for light truck tires. RMA added that if their recommended changes are accepted, the number of modifications will not be as great and compliance could be accomplished on a more expedited basis, possibly within five (5) years from the date of the final rule.

JATMA stated that a 5-year lead time is required in case of tires supplied to original equipment manufacturers to evaluate and achieve the target performance for driving stability, riding comfort, and noise etc. Also, they stated that facilities need to be increased, test procedure needs to be formed, and employees need to be trained.

The Alliance, GM, Ford, DC, and Mitsubishi recommended that the new tire performance requirements and the amended vehicle requirements of FMVSS NO. 110 become optional as soon as the final rule is published, and become mandatory on September 1, 2007. They requested the longer lead

[21] The 88% used for the load in the high speed test is currently linked to the reserve load determination in FMVSS No. 110. In 1982, the agency stated in a rulemaking (47 FR 36180) that the 88% load on the test road wheel is equivalent to 100% load on a flat surface.

time because of the number of tires that will have to be changed in terms of materials/compounds or construction, and the time required to make these changes will have indirect effects on the vehicles which will require revalidation for braking, dynamics, fuel consumption, ride, handling, and noise/vibration, including legal noise requirements. Additionally, the Alliance stated that a tire designed to the new requirements cannot be mass-produced until it has been matched to a given vehicle, and the vehicle has been validated for braking, vehicle dynamics, fuel economy, ride, handling, etc. Therefore, the tire and vehicle effective dates must be the same.

DC stated that it cannot begin to conduct necessary vehicle development and tuning programs until an adequate supply of tires meeting any new regulations become readily available from the tire manufacturers (in quantities, styles, and sizes sufficient for vehicle development). They strongly urged that there must be at least a two year lag time between the sufficient availability of development tires meeting any new requirements and the vehicle level phase-in or effective date scheduled.

Advocates urged NHTSA to consider a one-year compliance delay from the date of a final rule effective on September 1, 2002, and believes that LT tires need to be improved just as quickly, if not more quickly, than P-metric tires and a delay in compliance for LT tires is not in the best interest of vehicle and traffic safety.

G. Shearography Analysis

JATMA stated that shearography is suitable for evaluation of new compound and new tire structure of developing products, but is too expensive and not suitable for a test to assure the quality of mass production goods.

The Alliance, Ford, ETRTO, GRRF, and ITRA/TANA stated that all shearography analysis techniques rely on a subjective assessment by a skilled operator and the present state of technology is such that they may not be acceptable as a regulatory control requirement.

PC supported the use of shearography analysis in conjunction with visual inspection. Additionally, Public Citizen recommended that the agency devise a list of all the possible indications of tire failure.

H. Revise UTQG

ETRTO, GRRF, and CU suggested that test requirements for Temperature in UTQG are useless once the correct service description including the Speed Symbol is required for the tires, which are then tested according to the corresponding high-speed test schedules in UN/ECE Regulations 30 and 54.

RMA urged NHTSA not to revise the existing UTQGS scope and testing conditions at this time.

I. Additional Questions

1. Opportunity To Harmonize

The Alliance, ETRTO, RMA, the Center for Regulatory Effectiveness (CRE), and GRRF stated that the adoption of a UN/ECE Regulation 30 type test, such as the GTS–2000 or proposed GTR, would help to ensure that safety standards are consistent worldwide and that the burden on industry through having to meet several differing standards of various countries is removed. CRE also suggested that NHTSA is obligated to consider the following voluntary consensus standards—ISO 10191, SAE J1561, and SAE J1633/ISO 10454 under the National Technology Transfer and Advancement Act. RMA argued that this action would assist the breaking down of barriers to trade and improve the acceptability of USA-produced tires in a global market.

RMA asserted that NHTSA's proposal might constitute a technical barrier to trade in violation of the WTO Agreement on Technical Barriers to Trade.

The Alliance stated that, even if the agency considers the current harmonization proposal unacceptable, the agency should commit to developing a harmonized proposal.

Advocates stated that NHTSA could use the data and testing protocols of the optional test for wet grip of tires discussed in the actions of the World Forum for Harmonization of Vehicle Regulations (WP.29) Working Party On Brakes and Running Gear (GRRF) as a departure point for determining how best to establish tire adhesion requirements to be included in the proposed new Standard No. 139.

2. ''Real-World'' Testing Procedures

ETRTO stated that ''real-world'' testing procedure need to be pursued by defining accelerated test conditions that reflect the effective failure mode of the tires in service.

GRRF supported the approach of using controllable, laboratory based tests wherever possible and provided that they reproduce in-service conditions.

Ford stated that vehicular testing is not practicable due to variation in vehicle size and loading and the wide range of wheel/tire combinations and that the tire standard should continue to be an equipment standard and that tires should continue to be certified by tire manufacturers.

3. Vehicle Model Year 1975

GRRF supported the cut-off date of 1975 and suggests that consideration is given to the retention of FMVSS No. 109 for tires for earlier vehicles.

4. Required Inflation Pressures

GRRF and ETRTO suggested that all U.S. tires should be marked with inflation pressures expressed in kPa, as per the internationally recognized standard units.

RMA stated that inflations pressures of 32, 36, 40 and 60 psi should be retained in the existing FMVSS No. 109 standard, but should not be included in the new FMVSS No. 139.

The Alliance and Ford believed the four pressures should be retained for tire rating and testing.

The Alliance requested that NHTSA remove the current and proposed requirement to round the psi equivalent of kPa to the next highest whole number, and to round the pound equivalent of kilogram to the closest whole number.

J. Other

1. Test Condition Tolerances

RMA suggested that NHTSA adopt the tolerances listed in ASTM–F–551 Standard Practice for Using a 67.23-in. (1.707-m) Diameter Laboratory Test Wheel in Tire Testing.

2. Tire Pressure Load Reserve Limit

RMA suggested that NHTSA should adopt a specific tire pressure reserve limit and comments that they will be petitioning the agency for such a ruling in the near future.

K. Costs[22]

RMA and ETRTO stated that the agency's estimate that the proposed standards will impose costs of $282 million on the tire industry is grossly inaccurate. RMA estimated that the first year costs would exceed $1.5 billion with a continuing annual cost to comply in excess of $400 million depending on the options chosen for the final rule.

ITRA stated that the agency's estimates also do not include small manufacturers and foreign manufacturers that import tires to the U.S, and retreaders, and that the proposed regulation could result in the downfall of the retread industry.

[22] Comments on costs are discussed in greater detail in the FRE.

RMA, SEMA, ITRA/TANA, Denman, Hoosier, and Specialty tires stated that no cost/benefit analysis has been undertaken for limited production bias-ply and radial specialty aftermarket tires and the new testing requirements associated with NHTSA's proposed FMVSS No. 139 will jeopardize the specialty aftermarket tire industry unless special dispensation is made for these manufacturers. SEMA stated that at least three separate specialty tire manufacturers, Denman, Specialty Tires, and Hoosier are small businesses employing less than 1,000 people.

GM and the Alliance stated that NHTSA has not considered the potential influence of changes to the tire on the performance of the vehicle and that vehicle modifications of significant magnitude would cost the industry substantial amounts in investment and unit costs per vehicle.

L. Benefits [23]

GRRF asserted that the analysis of benefits appears to be incorrectly based on the assumption that the problems recently experienced have been caused primarily by incorrect design rather than by difficulties in manufacture, improper application, general poor maintenance or abuse during service.

The Alliance stated that the basis for the estimated benefits is unsubstantiated because of the lack of specific information on the causes of tire failures and because of the agency's inability to estimate what proportion of tires would need improvement and by what amount.

Advocates argued that there is little doubt that a reduction in tire failure rates would result in fewer blowouts and, therefore, fewer rollover crashes. They also asserted that tire failures and their role in crashes are severely underreported and, therefore, that the benefits are much greater than the agency is able to quantify. Advocates agreed with the agency that the benefits of stronger standards ensuring greater speed and heat tolerance for both P-metric and LT tires are intuitively apparent even though it is typically more difficult to quantify benefits for crash avoidance rulemaking proposals than for crashworthiness proposals.

PC argued that the resulting societal costs (*e.g.*, loss of workplace productivity, fatalities, medical costs, property damage costs and costs of travel delay on congested roadways) of motor vehicle crashes must be considered when estimating the benefits of a proposed regulation and that reducing the variability of tires could yield benefits from the proposed tests.

VI. Agency Decision Regarding Final Rule

A. Summary of Final Rule and Rationale

The agency is establishing a single standard for light vehicle tires, FMVSS No. 139, *New Pneumatic Radial Tires for Light Vehicles.* Under this standard, light vehicle tires are required to meet a high-speed test, an endurance test, a low inflation pressure performance test, a resistance-to-bead unseating test, and a road hazard impact/strength test. The standard applies to tires for passenger cars, multipurpose passenger vehicles, trucks, buses and trailers with a gross vehicle weight rating (GVWR) of 4,536 kilograms (10,000 pounds) or less, manufactured after 1975.[24] The following chart compares the types of test requirements that currently exist, those that have been suggested by third parties, and those are being established by this agency:

TABLE 1.—COMPARISON OF TYPES OF TIRE PERFORMANCE REQUIREMENTS IN VARIOUS EXISTING AND DRAFT TIRE STANDARDS

Tests	FMVSS 109	FMVSS 119 ††	GRRF draft GTR	GTS–2000	RMA 2000	ECE R30	FMVSS No. 139 (As adopted)
High Speed	X	....	X †	X	X	X	X
Endurance	X	X	X *	X **	X	....	X
Low pressure performance	....	....	....	....	....	....	X
Strength; or Road Hazard Impact	X	X	....	....	....	....	X
Bead Unseating	X	....	X ***	....	....	....	X
Accelerated Aging	....	....	....	....	....	....	....

* Endurance test for radial tires rated "Q" and below. Identical testing parameters as FMVSS No. 109 Endurance Test.
** Endurance test for radial tires rated "Q" and below.
*** Identical testing parameters as FMVSS No. 109 bead unseating test.
† Testing parameters had not been agreed upon by the ad hoc working group.
†† For LT tires only.

Both the high speed test and the endurance test specify testing parameters (ambient temperature, load, inflation pressure, speed, and duration) that make the tests more stringent than those tests currently found in FMVSS Nos. 109 and 119, as well as the tests suggested by industry. Most significantly, the proposed high speed test specifies test speeds (140, 150 and 160 km/h (87, 93, and 99 mph)) substantially higher than those specified in FMVSS No. 109 (120, 128, 136 km/h (75, 80, 85 mph)). Likewise, the endurance test specifies a test speed 50% higher (120 km/h (75 mph)) than that currently specified in FMVSS No. 109 (80km/h (50 mph)), as well as a duration 2 hours longer (24 hours) in the final load step than that proposed in the NPRM (22 hours). At the specified test speed (120 km/h), the endurance test mileage (2,550 miles) is 50% longer than the mileage that a tire endures under the current endurance test (1,700 miles).

The final rule also adopts a low inflation pressure performance test that seeks to ensure a minimum level of performance safety in tires when they are underinflated to 140 kPa (20 psi).

Instead of replacing the current strength test in FMVSS No. 109, the agency is retaining that test for passenger cars and retaining the strength test in FMVSS No. 119 for LT tires. Agency testing data and public comments called into question whether the test proposed in the NPRM, a road hazard impact test that is modeled after a SAE recommended practice, is both more stringent than the FMVSS No. 109 "plunger test" and correlates well with actual field performance. The FMVSS

[23] Comments on benefits are discussed in greater detail in the FRE.

[24] This final rule is applicable to LT tires up to load range E. This load range is typically used on large SUVs, vans, and trucks.

Nos. 109 and 119 strength tests will remain until the agency completes its research on road hazard impact and decides whether to initiate rulemaking to adopt a new or revised test.

The final rule also retains the current FMVSS No. 109 bead unseating test and extends it to LT tires. Industry has previously recommended to the agency that the current bead unseating test be deleted from the standard because radial tires are easily able to satisfy the test. Results from the agency's 1997–1998 and 2001 rollover testing, however, provided a strong rationale for upgrading, rather than deleting, the bead unseating requirement in FMVSS No. 109. The agency proposed a new bead unseating test that is based on a test currently used by Toyota, which uses test forces more stringent than those in current FMVSS No. 109 and appeared more applicable to radial tires. Agency testing data and comments, however, called into question whether the Toyota test provides both a more stringent and more real world test than the FMVSS No. 109 bead unseating test. The FMVSS No. 109 bead unseating test will remain in the standard until the agency completes its research on bead unseating and decides whether to initiate rulemaking to adopt a new or revised test.

At this time, the agency is not adopting a test to address the deterioration of tire performance caused by aging. The proposal set forth three alternatives for an aging effects test: the adhesion (peel) test, Michelin's long-term durability endurance test, and oven aging. All seek to expose tires to conditions that cause the type of failures experienced by consumers at 40,000 kilometers or beyond. Because the agency had little data and analysis on either of these tests and understood the tire industry to conduct testing related to the effects of aging on a regular basis, it requested comments on which test would be appropriate for inclusion in the new standard. The tire industry did not, however, include this testing data and analysis in its comments on the NPRM. Further, the agency was unable, in the time period allotted by the TREAD Act, to perform comprehensive testing and analysis of the proposed aging tests and any other alternative tests and parameters. Recently, however, some industry members have begun a dialogue and offered to share data with the agency.

The agency is commencing its own research on tire aging, building on information and data provided by Ford. The agency anticipates publishing a NPRM proposing an aging test, to be included in FMVSS No. 139, in approximately two years.

The final rule also revises FMVSS No. 110 to define Vehicle Normal Load as "no greater than 94% of tire load rating at vehicle placard pressure." FMVSS Nos. 110 and 120 are revised to reflect the applicability of the new standard.

Lastly, the final rule establishes June 1, 2007 as the effective date for all requirements contained herein, for all covered tires and vehicles.

As documented here and in the FRE, the upgraded requirements in the standard specify more stringent and real world, yet practicable, tests that will provide a higher level of operation safety and performance for tires on today's light vehicles.

B. Summary of Key Differences Between NPRM and Final Rule

The major changes to the standard (or deviations from the proposal) are as follows:

(1) *Endurance test.* The agency is reducing the duration of the endurance test from 40 hours to 34 hours, but extending the final load step from 22 to 24 hours. The agency is also reducing the load percentages from 90/100/110% to 85/90/100%.

(2) *Low pressure performance test.* The agency is adopting the first alternative (endurance) of the low pressure performance tests.

(3) *Bead unseating test.* The agency is retaining the FMVSS No. 109 bead unseating test for P-metric tires and extending that test to LT tires.

(4) *Strength test.* The agency is retaining the FMVSS No. 109 strength test for P-metric tires and the FMVSS No. 119 strength test for LT tires.

(5) *Aging effects performance test.* The agency is deferring adoption of an aging effects performance test until it completes its research and issues a new proposal.

(6) *Bias ply tires.* The agency is excluding bias ply tires from FMVSS No. 139. Bias ply tires will remain subject to FMVSS No. 109.

(7) *Vehicle normal load.* The vehicle normal load is defined as "no greater than 94% of tire load rating at vehicle placard pressure."

(8) *Ambient temperature.* The agency is reducing the ambient temperature in the high speed, endurance, and low pressure performance tests from 40° C to 38° C.

(9) *Effective dates/implementation.* The agency is providing a 4-year lead time for both tire and vehicle requirements. All covered tires and vehicles must comply with the final rule by June 1, 2007.

C. Performance Requirements

1. High Speed Test

The agency is adopting a high speed test for FMVSS No. 139 to be conducted using the following five parameters:

(1) Ambient Temperature: 38° C.

(2) Load: 85 percent.

(3) Inflation Pressure: 220 kPa (32 psi) for standard load p-metric; 260 kPa (38 psi) for extra load p-metric; 320 kPa (46 psi), 410 kPa (60 psi), 500 kPa (73 psi) for LT load ranges C, D, E, respectively.

(4) Speed: 140, 150, 160 km/h

(5) Duration: 90 minutes total—30 minutes for each speed.

A tire is deemed to comply with the requirements if, at the end of the high speed test, there is no visual evidence of tread, sidewall, ply, cord, inner liner, or bead separation, chunking, broken cords, cracking, or open splices, and the tire pressure is not less than the initial test pressure. FMVSS No. 109 currently requires a "visual evidence" requirement. "Visual evidence" means visible to the unaided eye.

The agency is adopting a high-speed test with three pre-selected speeds. This testing methodology is different from that in two alternatives that the agency initially considered: (1) GTS–2000, and (2) a high speed test using identical parameters to those proposed above, except that the test speeds are based on the rated speed of the tire (initial test speed (ITS),[25] ITS + 10, ITS + 20, ITS + 30) for durations of 20 minutes at each speed step with a 10-minute warm-up from 0 km/h—ITS.

The methodology suggested by the tire industry in GTS–2000 for tire harmonization and the second alternative determines the test speed based on the tire's rated speed.

Historically, the agency has established the same minimum performance requirements for similar items of motor vehicle equipment. We see no compelling reason for a departure in this case. Our normal practice assures the public of minimum safe performance, regardless of the type of tire purchased.

The agency's test, based on pre-selected test speeds and independent of

[25] The initial test speed (ITS) in GTS–2000 is the rated speed of the tire minus 40 km/h. The test is conducted at the following speed steps: ITS, ITS+10 km/h, ITS+20 km/h, and ITS+30 km/h. The final speed step, ITS+30 km/h, is 10 km/h below the rated speed of the tire. The ITS in the second alternative is the rated speed of the tire minus 30 km/h. The test is conducted at the following speed steps: ITS, ITS+10 km/h, ITS+20 km/h, and ITS+30 km/h, with the final speed step being identical to the rate speed of the tire. Therefore, under both alternatives, each tire with a different speed rating is tested at different speeds during the high speed test.

the rated speed of the tire, establishes the same minimum requirement for all tires, regardless of the designed level of performance. We believe that such a methodology is equitable for all tire manufacturers and does not impose higher safety requirements on a tire with a higher level of performance.

The following table provides a comparison of the high speed parameters used in FMVSS No. 109, GTS–2000, and FMVSS No. 139.[26]

TABLE 2.—HIGH SPEED TEST COMPARISON

Test parameters	FMVSS No. 109	GTS–2000	FMVSS No. 139 (As proposed)	FMVSS No. 139 (As adopted)
Ambient (°C)	38	25	40	38
Load (%)	88	80	85	85
Inflation Pressure (kPa):				
Standard load P-metric	220		220	220
Extra load P-metric	260		260	260
LT load range C/D/E			320/410/500	320/410/500
Speed Rating (Std/Extra):				
L,M,N		240/280		
P,Q,R,S		260/300	220	220
T,U,H		280/320	220	220
V		300/340	220	220
W,Y		320/360	220	220
ZR		320	220	220
Test speed* (km/h)	75, 80, 85 mph	ITS, +10, +20, +30	140, 150, 160	140, 150, 160
Duration (mins)	90 (30, 30, 30)	50 (10, 10, 10, 20)	90 (30, 30, 30)	90 (30, 30, 30)

*ITS is defined as the tire's rated speed minus 40 km/h.

a. Ambient Temperature

RMA, ETRTO, GRRF, and JATMA argued that the proposed temperature increase from 38° C to 40° C would create considerable complexity for the industry since most other testing is conducted at 38° C and suggested retaining 38° C as the ambient temperature for all tests. Consumer group commenters supported the agency's modification of the temperature parameter, stating that it better simulates real world conditions.

The agency has decided to adopt an ambient temperature of 38° C for the final rule instead of the ambient temperature of 40° C proposed by the agency. The agency was persuaded by the RMA DOE test data, which indicate that a 2° C increase in temperature to 40° C results in only a 2° C increase in tire (measured at the belt edge) temperature measured during the test. Therefore, the increase in test stringency based on the proposed 40° C, as compared with 38° C, is negligible. The agency also acknowledges that the 2° C increase would add significant costs to tire testing because of the need for recalibration of temperature in testing labs for testing to this particular standard. As noted by commenters, all other foreign and voluntary standards organization standards utilize an ambient temperature of 38° C. The agency concurs with commenters that the little, if any, increase in stringency a 2° C does not justify the anticipated costs resulting from the proposed 2° C increase.

b. Load

Few commenters commented on this parameter. Ford recommended a high speed test load of 105%. GRRF stated that the load percentage used for testing should take into account the curvature of the test drum.

The load specified for the high-speed test is 85% of sidewall maximum load rating. Although this figure represents a slight decrease from the specification in FMVSS No. 109, test data from the agency's testing and from RMA's testing indicate that tire failure is more sensitive to speed and inflation pressure than to loading variations in the 80 to 90 percent range. A speed increase from 75, 80 and 85 mph to speeds of 160 km/h (99 mph) and higher more than offsets the small decrease in test load specification and results in a more stringent test. In Phase I of the agency's testing, 5 of 9 P-metric tires failed at 90 percent load and 2 of 9 failed at 80 percent load. Phase II of the testing included testing of 8 P-metric, 5 samples each, at 80 and 85 percent loads, and with all other test parameters remaining constant (inflation pressure—220 kPa, 20-minute steps, speeds ITS to ITS + 30 km/h). These tests demonstrated that fewer tire failures occurred at 85% load than at 80% load.[27] At 85% load, 5 of 8 tire brands had no tire failures in their 5 samples and the other three brands had at least one failure in the five samples. One brand experienced failures in all 5 samples tested to the high speed test. Four brands of LT tires were also tested and all samples for each of the brands completed the high speed test at 85% load without any failures. This testing indicates that small increases in tire load have less of an impact on the interval between beginning the test and tire failure as compared with changes in inflation pressure and test speed.

In addition, the requirement for a tire reserve under normal loading conditions currently applies only to passenger cars. This final rule requires light trucks for the first time to have a specified tire reserve under normal loading conditions. Light trucks will have to provide the same 6 percent reserve or vehicle normal load on the tire required for passenger cars which is defined as ''no greater than 94% of tire load rating at vehicle placard pressure.''

Ford's recommendation to increase the load percentage to 105 percent of the maximum rated load for the tire is too stringent for the loading condition. Ford did not provide any data or test results to support its recommendation.

c. Inflation Pressure

RMA suggested that the agency base the test inflation pressure on the rated speed of the tire. Tires rated P, Q, R, and S would be tested at 260 kPa; tires rated T, U, H would be tested at 280 kPa; tires rated V would be tested at 300 kPa; and tires rated W, Y, and Z would be tested

[26] FMVSS No. 119 does not currently include a high speed test for LT tires with a rim diameter above 14.5 inches.

[27] A small number of tires were tested. However, this small sample included many brands and included high performers and low performers. This contributed to the variation of outcome.

at 320 kPa. RMA also suggested that the proposed inflation pressures result in more overload (or over-deflection) in light truck tires compared to passenger tires and suggests the following test pressures: LT load range C: 330 kPa; LT load range D: 425 kPa; and, LT load range E: 520 kPa.

These inflation values, however, are too high for testing because they do not reflect values that are similar to the cold inflation pressures recommended by vehicle manufacturers and are not representative of inflation pressures obtained from vehicles measured during the consumer tire pressure surveys.

The agency establishes a test inflation pressure of 220 kPa (32 psi) for all unrated and speed rated P-metric tires and 260 kPa for extra load tires. The agency establishes the following inflation pressures for LT tires based upon their higher maximum inflation pressures: 320 kPa for load range C, 410 kPa for load range D, and 500 kPa for load range E tires.

The adopted inflation pressures are based on surveys showing that tires are typically operated at some level of underinflation.[28] Given the tire pressure survey data, the agency selected the proposed test pressures based on the level of underinflation experienced during normal vehicle operation. The 220 kPa value represents an under-inflation of 20 kPa (3 psi) or 8 percent from the 240 kPa maximum inflation pressure, and 260 kPa represents an under-inflation of 20 kPa (3 psi) or 7 percent from the 280 kPa maximum inflation pressure.

The agency believes that RMA's inflation pressure values are too high for high speed testing because (1) they do not reflect values that are similar to the cold inflation pressures recommended by vehicle manufacturers, and (2) they do not correspond well with the real-world inflation pressures recently obtained from the vehicles measured during a recent NHTSA sponsored consumer tire pressure survey.[29]

Although 220 kPa is the same test pressure specified in FMVSS No. 109, this test pressure, in conjunction with the higher test speeds, represents a more stringent test than that contained in FMVSS No. 109. Further, agency test results indicate that 220 kPa is a test inflation pressure that is appropriate for the high speed test given the parameters of speed, load and test duration.

d. Speed

The majority of commenters who commented on the high speed test recommended that the agency adopt speeds for this test based on the rated speed of the tire. Commenters suggested this approach, arguing that consumers rely upon speed ratings to select an appropriate tire for their vehicles. Also, some commenters noted that calculating the test speed based on the speed rating of the tire is an approach identical to that used in the European tire regulation, ECE R30, GTS–2000, and in the Society of Engineers (SAE) Recommended Practice J1561, *Laboratory Speed Test Procedure for Passenger Car Tires.* Some commenters stated that speed steps based on speed ratings provide a more stringent test and greater promise for achieving future international harmonization. The Alliance commented that the agency should consider the high speed test in GTS–2000 for harmonization reasons and also because there is no evidence of a safety problem with tires complying with ECE R 30, which is the European high speed test procedure upon which GTS–2000 is modeled. RMA suggested that if the agency did not base test speeds on speed ratings, then it should reduce the test speeds for LT tires to 130, 140, and 150 km/h to approximate the same level of stringency for LT tires tested on a test wheel (temperature increase) experienced by P-metric tires tested on a test wheel. GM suggested that we consider establishing 120 mph as a fixed test speed value since many of their light trucks are equipped with LT tires speed rated Q and R 160 km/h (99 mph) and 170 km/h (106 mph), respectively.

NHTSA has decided to adopt the proposed speeds of 140, 150, 160 km/h (87, 93, 99 mph) for P-metric and LT tires. These speeds represent a substantial increase in the level of stringency from the test speeds currently used in FMVSS No. 109 and 119 for which tires are tested at 75, 80, and 85 mph for 30 minutes at each speed. This approach more closely mirrors the upper limit of real world operational speeds in the United States beyond which drivers have few opportunities to operate their vehicles. These speeds will also eliminate from production any current tires whose performance just achieved the lowest rung of Temperature resistance rating in our Uniform Tire Quality Grading standards (UTQG), "C" rated tires. Tires with a UTQG temperature grade "C" are less resistant to heat buildup as compared to tires rated "A" or "B."

Drivers in the U.S. do not typically operate their vehicles at speeds above 100 mph. Maximum speed limits on U.S. highways range from 55 to 75 mph. Some vehicle manufacturers, *e.g.,* GM and Ford, electronically restrict most of their vehicles top speeds at approximately 106 mph. NHTSA also believes that an upper test speed threshold of 160 km/h (99 mph) ensures a minimum level of safe operation that is 25–30 mph beyond typical speed limits on interstate highways in the U.S.

Under the UTQG test procedure, a tire is rated "C" if it fails to complete the test at 100 mph for 30 minutes. The test is initiated at 75 mph for 30 minutes and then successively increased in 5 mph increments for 30 minutes each until the tire has run at 115 mph for 30 minutes. Therefore, tires with a temperature grading of C may be able to complete 30 minutes at speeds of 75, 80, 85, 90, and 95 mph (120, 128, 136, 144, and 152 km/h), but not complete the 100-mph (160 km/h) step. By establishing the final step of the high speed test at 160 km/h (99 mph), the agency expects that a larger number of tires with a temperature grade of "C" may fail the minimum performance test in the tire standard.

This decision does not prohibit tire manufacturers from continuing the practice of using speed ratings as a basis for establishing maximum design speed characteristics for tire performance. As discussed in the Tire Safety Information final rule, the agency neither requires nor prohibits that tires be labeled with a speed rating. Additionally, we do not prohibit vehicle manufacturers from specifying that consumers purchase replacement tires labeled with the same speed rating as the OE tire.

The agency has decided not to reduce the test speed for LT tires. The agency is not aware of any data, nor has it been

[28] A tire pressure survey conducted by Viergutz, *et al.*, on 8,900 tires in 1978 reported that almost 80 percent of all tires were under-inflated with approximately 50 percent under-inflated by 4 psi (28 kPa) or more below the recommended pressure. The average amount of under-inflation recorded in this survey was approximately 3.2 psi (22kPa) below the recommended amount. More recently, data from the 2001 NASS Tire Pressure Study, conducted on over 11,000 vehicles, indicate that about 60 percent of P-metric tires used on passenger cars were under-inflated with about 40 percent being under-inflated by 3 psi or more below the recommended inflation pressure. For P-metric tires used on light trucks, about 70 percent were under-inflated, with about 50 percent under-inflated by 3 psi or more below the recommended inflation pressure.

[29] In Spring 2001, the National Center for Statistics and Analysis (NCSA) conducted the 2001 National Automotive Sampling System (NASS) Tire Pressure Special Study (NASS Study) in response to the TREAD Act. The Preliminary Analysis of Findings, 2001 NASS Tire Pressure Special Study, dated May 4, 2001, has been placed in Docket No. NHTSA–00–8572. Data obtained as part of this study indicate that about 36 percent of passenger cars and 40 percent of light trucks had at least one tire that was at least 20 percent below the vehicle manufacturer's recommended cold inflation pressure. About 26 percent of passenger cars and 29 percent of light trucks had at least one tire that was least 25 percent below the vehicle manufacturer's recommended cold inflation pressure.

provided with any, that suggest that light trucks equipped with LT tires are operated at lower speeds than light trucks equipped with P-metric tires. In fact, tire industry data indicate that light truck owners choose LT tires as replacement tires more often than the installation rate for LT tires by the OE vehicle manufacturer. (*Modern Tire Dealer* (*http://www.mt.dealer.com*), *RMA Factbook 2002*)

The agency is also adopting a 2-hour break-in period for the test. Current FMVSS No. 109 requirements include a 2-hour break-in. The NPRM proposed a 15-minute break-in for the test, essentially because RMA had indicated in connection with GTS–2000 that a break-in period was unnecessary. Since that time, RMA has reversed its position on this issue based on its high speed testing. Additionally, the agency, based on its own testing and experience with the 2-hour break-in period believes that this length of break-in enhances test repeatability by making the surface of the tire consistent, *e.g.,* removing tire ''whiskers'' from the tire tread surface.

e. Duration

RMA's suggested 10-minute durations at each speed step (10-minute speed build-up from 0 km/h to ITS, then three 10-minute speed steps and one 20-minute speed step).

Agency testing indicates that 10 minutes is too short a period to provide a proper evaluation of high-speed performance. Very few failures occurred in the agency's testing using the 10-minute duration for speed steps. Additionally, RMA indicated in its DOE that the tire temperature generally stabilized within 15 minutes for any given set of test conditions. RMA's suggestion also reduced the duration in FMVSS No. 109 by almost 50 percent.

NHTSA adopts a 30-minute test duration for each of the 3 speed steps, 140, 150, and 160 km/h. The total test time equals 90 minutes. The 30-minute duration allows the tire to attain and stabilize its operating temperature at each speed step so that the tire's performance can be evaluated during a steady rate of speed for a duration longer than 10 minutes.

2. Endurance Test

The agency is adopting an endurance test for FMVSS No. 139 to be conducted using the following five parameters:

(1) *Ambient Temperature:* 38° C.

(2) *Load:* 85/90/100 percent.

(3) *Inflation Pressure:* 180 kPa (26 psi) for standard load P-metric; 220 kPa (32 psi) for extra load P-metric; 260 kPa (38 psi), 340 kPa (49 psi), 410 kPa (59 psi) for LT load ranges C, D, E, respectively.

(4) *Speed:* 120 km/h.

(5) Duration: 34 hours total—4 hours at 85 percent load, 6 hours at 90 percent load, and 24 hours at 100 percent load.

A tire complies with the proposed requirements if, at the end of the high speed test, there is no visual evidence of tread, sidewall, ply, cord, or bead separation, chunking, broken cords, cracking, or open splices, and the tire pressure is not less than the initial test pressure.

This combination of these parameters for P-metric tires is believed to correlate well with actual field performance and represents an increase in stringency over FMVSS No. 109's endurance test with a 50 percent increase in speed.

Two alternatives to the proposed test parameters were considered by the agency, that submitted by RMA and that submitted by Goodyear. The RMA alternative includes no change in the load combination of 85/90/100 percent and duration from the current standard, FMVSS No. 109, retains the 120 km/h from the agency proposal for P-metric tires but a lower speed (110 km/h) for LT tires, and recommends increasing the inflation pressure for LT tires. The Goodyear alternative is similar to RMA's except that they suggest a test speed of 104 km/h and do not adjust down the inflation pressures for LT tires. Both of these tests, especially the Goodyear test, demonstrate a lower failure rate than the agency's tests.

The agency adopts an endurance test that has parameters different from those proposed in the NPRM. The load decrease of 10% from the proposed loading level represents an offset of the effects of the test wheel. Further, the agency notes that the increase in duration of the final load step from 22 hours in the proposal to 24 hours combined with the adopted test speed of 120 km/h represents an increase in the total test distance from 2720 km (1700 miles) to 4080 km (2550 miles).

The following table provides a comparison of the endurance test parameters used in FMVSS No. 109, FMVSS No. 119, RMA recommendation, and FMVSS No. 139.

TABLE 3—ENDURANCE TEST COMPARISON

Test parameters	FMVSS 109	FMVSS 119	RMA	Goodyear	Proposed FMVSS 139	FMVSS No. 139 As adopted
Ambient (°C)	38	38	38	38	40	38
Load (%):						
P-metric	85/90/100		85/90/100	85/90/100	90/100/110	85/90/100
LT-load C/D		75/97/114	85/90/100	85/90/100	90/100/110	85/90/100
LT-load E		70/88/106	85/90/100	85/90/100	90/100/110	85/90/100
Inflation Pressure (kPa):						
Standard load P-metric.	180		180	180	180	180
Extra load P-metric	220		220	220	220	220
LT-load C/D		max infl	285/370	260/340	260/340	260/340
LT-load E		max infl	450	410	410	410
Speed (km/h)	80	80	120 (75 mph) (110 km/h for LTs).	104 (65 mph)	120 (75 mph)	120 (75 mph)
Duration (hrs)	34 (4/6/24)	34 (4/6/24)	34 (4/6/24)	40 (8/10/22)	40 (8/10/22)	34 (4/6/24)

a. Ambient Temperature

The agency has decided to lower the ambient temperature to 38° C from the 40° C proposed in the NPRM for the same reasons cited in the high speed test discussion.

b. Load

In its comments to the NPRM, RMA recommended an endurance test using lower loads, 85/90/100 percent of maximum load rating for 34 hours for both P-metric and LT tires due to high percentages of failures due to chunking.

Goodyear commented that (1) heat induced damage mode (Tread Chunking) exhibited in proposed FMVSS No. 139 endurance testing is not representative of real world failures in the field, (2) tires with proven safe field performance will not pass the proposed FMVSS No. 139 due to tread chunking caused by excessive heat build-up due to high speed on curved surface and high load conditions, and (3) tire design changes/compromises to reduce heat-induced tread chunking will negatively impact other safety performance characteristics (*e.g.*, wet traction, wet handling, dry traction).

Public Citizen urged the agency to adopt a higher load of 100/110/115 percent to provide for loading conditions of heavier commercial vehicles.

After studying the effects of the test parameters on the failure rates for the proposed endurance test, the agency has decided to lower the load percentages to 85/90/100 percent of the maximum load rating. The 5% decrease in load in the first test step and, more importantly, the 10% decrease in the second and third test steps are adopted to offset the effect of the temperature increase that occurs on the curved surface of the test wheel.

c. Inflation Pressure

For LT tires, RMA recommended higher inflation pressures claiming that higher inflation pressures help offset the increased deflection and higher temperatures experienced by LT tires on the test wheel which makes the stringency of the test for LT tires more significant than that experienced by P-metric tires. RMA's data, however, indicates that LT tires also experience higher temperatures than P-metric tires when tested on a flat surface.[30]

The inflation pressures contained in this final rule remain unchanged from those proposed in the NPRM. Since LT tires experience higher temperatures than P-metric tires under real world conditions, the agency sees no need to adjust the test stringency in attempt to make equivalent the thermal levels experienced by LT tires and P-metric tires on the test wheel.

The inflation pressure of 180 kPa represents a 25 percent under-inflation for 240 kPa maximum inflation pressure tires and is the same inflation pressure currently required for the endurance test in FMVSS No. 109. Tires tested to more severe levels of underinflation, *e.g.*, 160 kPa, failed much sooner into the endurance test than those tested at 180 kPa.

[30] Based on RMA's DOE, the temperature differential between P-metric tires and LT tires on a road test wheel is 28° C, compared to 21° C on a flat surface.

d. Speed

For LT tires, RMA recommended a lower test speed of 110 km/h claiming that a lower test speed makes the stringency of the test for LT tires equivalent to that for P-metric tires. Goodyear recommended 104 km/h for all tires stating that the combined load and speed of the test produces excessive temperature conditions on a test wheel.

The speed contained in this final rule remains unchanged from that proposed in the NPRM. The test is conducted at 120 km/h (75 mph). The current endurance test in FMVSS No. 109 is conducted at 80 km/h (50 mph). An 80 km/h test speed may have been an appropriate test speed in 1968 when initially proposed for bias ply tires. However, today, it is too low a speed for evaluating the endurance of today's tires given current vehicle performance capabilities and speed limits.[31] In addition, speed limits on interstate highways across the U.S. are now as high as 75 mph.

The agency considered RMA's recommendation for a lower test speed for LT tires. RMA's DOE showed higher tire temperatures for LT tires compared with P-metric tires, both on the flat surface and on the curved test wheel. We acknowledge that LT tires run hotter than P-metric tires but see no need to try to make the stringency levels equivalent in laboratory testing if they do not run at equivalent levels on the road. In the real world, P-metric tires and LT tires are often operated on light vehicles in the same manner, *e.g.*, same speeds, same attention, or lack thereof, to proper inflation levels. Additionally, the agency adjusted the parameters for load, duration, and temperature to achieve a more realistic and practicable test. Given that vehicles equipped with LT tires are operated at similar speeds as vehicles equipped with P-metric tires, the agency does not accept this suggestion.

e. Duration

The duration specified for the endurance test has been lowered to 34 hours from the 40 hours proposed in the NPRM.

The agency's confirmation testing to the endurance parameters proposed in the NPRM indicated that the failure rate was 27 percent for P-metric tires and 40 percent for LT tires. A majority of these failures occurred between the 35th and 40th hours of the 40-hour test. The failure mode for these tires was chunking of the tire tread. Chunking is the breaking away of pieces of the tread or sidewall. Chunking may be an early indicator of other potential tire problems, but the agency, at present, does not have data indicating the frequency with which chunking occurs in service or the rate at which other tire problems are precipitated by chunking.

The agency anticipates that with the duration reduced to 34 hours, a lower percentage of tires will fail the test because of chunking. In anticipation of concerns that the lowered duration reduces the stringency of the test, the agency notes that for the 34-hour duration, the maximum test load is achieved after 10 hours from initiation of the test, while for the 40-hour duration that was proposed in the NPRM, the maximum test load is only achieved after 18 hours. Additionally, the final load step is 2 hours longer (24 hours) than the one proposed in the NPRM (22 hours). For these reasons, the agency considers the 34-hour test as possibly more stringent than the proposed 40-hour test.

Ford recommended extending the duration of the test by adding an additional 48-hour test step at a load equaling 130 percent of the maximum load rating of the tire. Ford did not provide any data or test results to support this recommendation.

[31] According to *Automotive News* (5/14/01), "since 1981, average horsepower has risen 79 percent and vehicle weight has grown 21 percent." The power to weight ratio has increased over the past 10 years based on data on selected mid-priced Ford, Chevrolet, Pontiac, Toyota, and Honda vehicles ranged from about 70 to 90 horsepower (HP) per ton. (Ward's Automotive Yearbooks, 1990 and 2000). In 1995, the federally-mandated 55 mph speed limit was repealed. Since that time, numerous States have increased speed limits up to 75 mph.

3. Low Inflation Pressure Performance Test

The TREAD Act requires that light vehicles be equipped with a tire pressure monitoring system, effective November 1, 2003, to indicate to the driver when any of the tires on his vehicle is significantly underinflated. NHTSA established 20 psi (140 kPa) as a low pressure threshold at or above which the low pressure lamp must be activated in its recent final rule on TPMS. (67 FR 38704, June 5, 2002)

NHTSA includes in the new light vehicle tire standard a low inflation pressure test, the Alternative 1, Low Pressure—TPMS test, to ensure a minimum level of endurance and/or high speed performance/safety when operated at a significant level of under-inflation. The parameters for this test, which the tire must complete without failure, are as follows:

(1) Load: 100 percent

(2) Inflation pressure: 140 kPa (20 psi) for P-metric

(3) Test speed: 120 km/h (75 mph)

(4) Duration: 90 minutes at the end of the 34-hour endurance test

(5) Ambient temperature: 38° C

A tire complies with the requirements if, at the end of the test, there is no visual evidence of tread, sidewall, ply, cord, inner liner, or bead separation, chunking, broken cords, cracking, or open splices, and the tire pressure is not less than the initial test pressure.

The following table provides a comparison of the low inflation pressure performance parameters proposed in the NPRM and those established in FMVSS No. 139.

TABLE 4.—LOW INFLATION PRESSURE TEST

Test parameters	Proposed Alternative 1	Proposed Alternative 2	FMVSS No. 139 As adoped
Ambient (°C)	40	40	38
Load (%)	100% of maximum load rating on tire.	67% of maximum load rating on tire.	100% of maximum load rating on tire
Inflation Pressure (kPa):			
Standard load P-metric	140	140	140
Extra load P-metric	160	160	160
LT-load C	200	200	200
LT-load D	260	260	260
LT-load E	320	320	320
Speed (km/h)	120	140/150/160	120
Duration (mins)	90 (30/30/30)	90 (30/30/30)	90 (30/30/30)

RMA expressed support for Alternative 1, substituting a lower test speed, 110km/h, for LT tires instead of the proposed 120 km/h. RMA also stated that thermal runaway occurred on all the tires that it tested to the Alternative 2 test parameters. Both the Alliance and Ford suggested that the test be run on tires after they had been subjected to an aging test. Consumers Union recommended that the test duration of Alternative 1 be increased to 4 hours to better simulate the distance traveled (300 miles) on a tank of fuel.

The adopted test, Alternative 1, establishes a linkage between the proposed requirements of the tire pressure monitoring system standard and the endurance test for the tire standard upgrade requirements. It is predicated upon the notion that a low pressure test is most appropriate on tires that have completed the endurance test because a significantly underinflated condition for a tire is more likely to occur in a tire after several weeks of natural air pressure loss or due to a slow leak.

Besides nearly unanimous support from commenters, the agency believes that the parameters of this test more closely represent real world conditions. For instance, it is more likely that vehicles, particularly passenger vehicles, will travel at speeds closer to 120 km/h (75 mph) than 160 km/h (90 mph) and will be loaded closer to a 100% condition than a 67% condition. In essence, this alternative closely mirrors conditions of long distance family travel and would assist in ensuring that tires will withstand conditions of sudden or severe underinflation during highway travel in highly loaded conditions. Additionally, the agency believes that this test provides an extra safeguard to ensure that tires that were able to successfully complete the endurance testing can also complete an additional 90-minute test at low inflation pressures.

4. Road Hazard Impact

For a road hazard impact performance requirement, the agency had proposed the adoption of the current SAE Recommended Practice J1981, *Road Hazard Impact Test for Wheel and Tire Assemblies* (Passenger Car, Light Truck, and Multipurpose Vehicles). This test had been developed by SAE to provide a uniform test procedure for evaluating the road hazard impact on wheel and tire assemblies.[32] Results from agency testing of 60 tires according to this procedure demonstrated no failures. Further, post-test inspection using visual methods, shearography, and x-ray revealed no evidence of damage to any of the tires.

In response to our proposal, commenters unanimously suggested that the proposed SAE procedure was not properly defined to test for tire-to-hazard impact worthiness. RMA argued that the test was originally developed as a wheel damage test and has very limited value as a tire test. Also, they argued that it was originally adopted to evaluate bias ply tires and is unnecessary for testing radial tires. The Alliance suggested that the current plunger test be retained until the agency develops a test that correlates with actual field performance. Ford also recommended that the current plunger test be retained but also revised to contain a higher load value and a revised test rim capable of accommodating the higher load without exhibiting ''bottoming out.'' Ford stated that it uses a force value twice as high as that specified in FMVSS No. 109 and its tires have experienced failures when tested to this specification. Commenters also questioned the practicability of the proposed test given the expected cost of new equipment to perform the test and the perceived lack of benefits exhibited by the absence of failures in NHTSA's research.

The agency's research on this test consisted of sixty tires tested in the agency's Phase 1A laboratory tire strength tests. All were P205/R15 size, with aspect ratios of 55, 65, or 75. Each tire was initially strength tested using one of the four following procedures: (1) SAE J1981 Road Hazard Impact test, with wedge-shaped striker, (2) SAE J1981 Road Hazard Impact test, with plunger shaped striker, (3) current FMVSS No. 109 tire strength test, and (4) modified FMVSS No. 109 tire strength test. All tires were submitted for post-test damage evaluation using visual inspection, x-ray, and shearography. Twenty of these tires were then subjected to the current FMVSS No. 109 high speed performance test, and then resubmitted for damage evaluation.

Only one of the 60 tires experienced air loss or damage detectable by the three evaluation methods. This tire experienced tread break and rapid air loss during a modified FMVSS No. 109 tire strength test. Tests on four of the 20 tires subjected to the SAE J1981 Road Hazard Impact tests, with wedge-shaped striker, resulted in damage to the rim, even though no air loss or tire damage

[32] The test machine specified in this recommended practice positions the tire so that the striker impacts it across the width of the tire tread with a free falling 54 kg pendulum striker. The impact force must be applied at five equally spaced points around the circumference of the tire.

was detected. A report that more fully discusses this data and analysis is contained in the Docket (NHTSA–02–8011–20).

The agency has decided to adopt for the new standard the current requirement for the plunger test in FMVSS No. 109 for P-metric tires and the current requirement for the strength test in FMVSS No. 119 for LT tires. Based on the agency's testing and the comments received in response to the proposal, the agency concludes that the SAE road hazard impact test is not suitable to evaluate the capability of a tire to resist damage from impacts with road hazards.

While the agency is not establishing a new or revised test at this juncture, information and data provided to the agency by Ford indicates that certain test forces and other specifications can be specified that would possibly evaluate tire-to-hazard impact worthiness performance. After completing the research on tire aging discussed below and then the research on bead unseating discussed below, the agency will conduct research to refine the current test and/or to identify and refine an alternative test that better simulates road hazard impact. When this research is complete, the agency will decide whether to initiate rulemaking on a new or revised test procedure for tire strength.

5. Bead Unseating

In response to our proposal, commenters consistently suggested that the proposed procedure required further research and specification to appropriately evaluate the ability of a tire bead to remain on the rim during varied maneuvers. For instance, the Alliance suggested that a test-wheel specification be developed because bead unseating is partially a function of the specific test wheel on which the tire is mounted. Similarly, Ford recommended that the agency include a specification for the test rim to accompany the test since the force required to unseat a tire bead is dependent on rim design. TUV Germany suggested that the agency utilize a dynamic (*e.g.*, rotating wheel) rather than a static test. Additionally, the levels of certain proposed parameters, *e.g.*, load and force and applied to the tire, were highlighted as needing further consideration.

Commenters also questioned the practicability of the Toyota test given the expected cost of equipment required to perform the test and the perceived lack of benefits resulting from the absence of failures in NHTSA's research. RMA suggested that the agency retain the current procedure, with revised specifications applicable to tires with smaller aspect ratios.

The current resistance to bead unseating test has the force applied to the center of the sidewall of the tire. The agency believes that while the Toyota test parameters may provide a more ''real world'' approach by applying forces in the tread area, they would not necessarily increase the overall stringency of the test. This belief is supported by agency research, which found that the Toyota test yields results (no failures) identical to those derived from testing tires to the current bead unseating test.

The agency's research on this test consisted of fifty-four tires evaluated in the agency's Phase 1A Tire Debeading tests for their propensity to debead. Each tire was bead unseat tested using one of the two following procedures: (1) A modification of a procedure developed by Toyota that utilizes a sliding wedge-based test fixture to apply a force across the tread until the tire debeads or the rim comes in contact with the wedge, and (2) a modified version of the FMVSS No. 109 test procedure which allows the plunger load to continue until bead unseating occurs. A report that more fully discusses these data is contained in the Docket (NHTSA–02–8011–21).

The agency has decided to include in the new standard the current requirement for bead unseating that exists in FMVSS No. 109. To make this requirement consistent for all light vehicle tries, the agency has also decided to extend this requirement to LT tires. While the agency is not establishing a new or revised test at this stage, it continues to believe that bead unseating may contribute to a major safety problem: rollover. Therefore, bead unseating, if appropriately addressed through a safety performance requirement, could beneficially impact rollover crash prevention.

Information and data obtained and analyzed by the agency indicate that tire bead unseating does occur in real world applications and that it contributes to rollover because rim contact with the road is a tripping mechanism that leads to a tripped rollover. During the agency's 1997–98 dynamic rollover testing, 3 out of 12 vehicles debeaded their tire during severe maneuvers. These three vehicles included a pick-up truck, a MPV, and a passenger car. All three vehicles were equipped with P-metric tires, and all were certified as complying with the current bead unseating requirements. TREAD rollover testing conducted in 2001 and 2002 also demonstrated debeading as a result of severe maneuvers.[33]

After completing the research on tire aging discussed below, the agency will conduct research to try to identify and refine an alternative test that better simulates bead unseating than the current test. If supported by our research results, the agency will initiate rulemaking to adopt an improved bead unseating test.

With regard to RMA's suggestion that the agency revised testing specifications for tires with smaller aspect ratios, the agency notes that the current testing apparatus (the ''block'') can be used to test a vast majority of tires in the OE and replacement market. Low aspect tires that may be problematic fits with the testing apparatus would, in any case, comply with the requirements because the block would contact/''bottom out'' on the rim before debeading could occur. The agency plans, during its bead unseating research, to review the design of the bead unseating apparatus and to determine whether and how to best modify it to accommodate low aspect ratio tires.

6. Aging

In the NPRM, the agency proposed adopting one of the following tests: (1) an adhesion (peel) test based on the American Society for Testing Materials (ASTM) D413–98, Standard Test Methods for Rubber Property-Adhesion to Flexible Substrate, (2) a long term durability endurance test based on Michelin's procedure for endurance testing, and (3) an oven aging test.

Commenters generally asserted that the three tests, as proposed, are not appropriate means of testing the effects of aging on tires or that they do not reflect real world performance. RMA opposed adoption of the peel strength test and the long term durability endurance test. RMA stated that the results of its testing in accordance with the ASTM D–413 protocol demonstrated that such testing has poor repeatability. Further, they assert that peel force does not correlate with field performance or the test wheel test because: (1) It evaluates only a component of the tire, not the tire's overall performance, (2) peel strength data inversely correlates with field data, and (3) it evaluates the tire's belt compound for ultimate tensile strength in a non-aged state and does not simulate long-term duration or field exposure.

RMA also opposed the long term durability endurance test stating that the length of the test would add a $100

[33] The tires involved in these debeading incidents passed the FMVSS No. 109 test.

million differential over the other options. RMA also stated that the industry has had little or no experience with this test methodology, although the test was suggested by Michelin, a member of RMA.

While RMA asserted that it finds an aging test redundant in light of the revised high speed, endurance, and low pressure tests, it did provide the agency with their suggestion for test parameters for the oven aging tests: (1) 70° C as the aging temperature instead of the proposed 75° C, and (2) three endurance steps of 4 hours at 85% load, 6 hours at 90% load, and 14 hours at 100% load.

The Alliance and Ford commented that the proposed aging tests cause the tire wedge to age anaerobically (caused by absence of oxygen), a condition that is not exhibited in ODI field data. Ford recommended a revised version of the agency's oven aging test using a 50/50 blend of oxygen/nitrogen as the filling gas and a 14 day duration in an oven followed by a dynamic test on a test wheel. Ford indicated that this test would simulate the performance of a tire oxidatively aged for 2–3 years.

ECE/GRRF suggested that the aging test be combined with the endurance test.

With regard to the 250-hour long-term durability endurance test, the agency does not have enough information to conclude that this test would be appropriate for regulatory purposes because of its length and resultant cost. Michelin has indicated that the test is most effective and provides better correlations at a duration of approximately 350–400 hours. This amount of time makes this test considerably more expensive than either a peel test or an oven aging test and would impose a large cost burden on the industry as well as a large regulatory burden on the agency's compliance testing. We cannot at present show that burden would be justified by the safety benefits.

The agency conducted Michelin-like dynamic aging testing (250-hour test inflated with oxygen-nitrogen mixture), oven aging testing, and adhesion strength testing. The parameters for the oven aging testing and adhesion strength testing are the same as those proposed by the agency. The data show that, in general, most of the tires completed the drum tests including the dynamic aging and oven aging tests. Three P-metric tires had catastrophic and partial damage failures during the dynamic aging tests, and two other P-metric tires had failures during the oven aging test. The adhesion data demonstrate a wide range of results from a low of 19.9 lbs/in to a high of 76.9 lbs/in adhesion strength between the tire belts. From these data, however, the agency has been unable to draw any definite correlations of tire conditioning on adhesion strength. A report that more fully discusses these data and analysis is contained in the Docket (NHTSA–02–8011–27).

The agency has decided to defer rulemaking on an aging test until further research is completed. The agency intends to develop and propose an oven-aging test for FMVSS No. 139 in approximately 2 years. In developing an oven-aging test, the agency will consider the recommendations submitted to the agency including those mentioned above pursuant to refining both the static and dynamic components of the test. Additionally, the agency will assess the performance of the test tires and tires in the field to assure that the test correlates with the field data. The agency has opened a docket for the collection of information relevant to tire aging (Docket No. NHTSA–2002–13865).

After analysis and consideration of the comments, as well as results from agency's own testing, the agency concurs with commenters that the peel test is not appropriate to pursue at this juncture. With regard to the peel test, RMA commented that its testing indicated an inverse correlation between peel strength and a tire's endurance. In the agency's testing, some tires that demonstrated a low peel strength value performed well under the proposed endurance parameters, while some tires that exhibited high peel strength values failed to complete the proposed endurance test. These results, along with RMA's suggestion that the peel test proposal evaluates a tire's belt compound for ultimate tensile strength in a non-aged state but does not simulate long-term duration of field exposure, has led the agency to determine that a peel test is not sufficiently useful for evaluating tire aging to be included in the standard as a performance requirement.

The agency acknowledges that, during the Firestone hearings, members of Congress suggested that an aging test could evaluate the risk of tire failure at a period later in the life of a tire than the period tested by the current endurance test. Additionally, reports (Clark, Govindjee) resulting from the Ford-Firestone investigation recommended that the agency should consider instituting an aging test in its revised regulation because of the known degradation of peel strength with time and temperature. For several reasons, the agency has been unable, during the limited time available, to develop a workable aging test with the capacity to enhance real world safety.

At present, an industry-wide recommended practice for the accelerated aging of tires does not exist. With the exception of Michelin, the tire industry did not respond to the agency's request in the NPRM for information on corporate design and testing specifications. Additionally, the agency did not acquire sufficient test data and field data to enable it to evaluate the performance of an aging test and determine whether correlations exist in the data. Recently, however, some industry members have begun a dialogue and offered to share data with the agency.

7. Post-Test Pressure Measurement

For the high speed, endurance, and low inflation pressure performance tests, the NPRM proposed that the inflation pressure be measured within 15 minutes after the completion of the specified test. Any decrease in pressure from the initial inflation pressure would signify failure. The agency had borrowed the 15 minute specification from GTS–2000 and because it represented what the agency thought was a more objective criterion than the current requirement in 109 for measurement to be taken ''immediately'' after the test.

In response to the proposal, RMA, citing safety reasons, urged the agency to revise the time-period for measurement to specify that it be taken within an hour. According to RMA, requiring measurement of the temperature of a hot tire, which must be performed manually, within 15 minutes of test completion subjects the technician to great danger due to the risk of tire explosion. Additionally, RMA argued that the additional time for measurement would not unfairly bias the success rates of the tires being tested because the inflation pressure would reduce, rather than increase, over time as the tire cools. Therefore, it is more likely that a tire tested within 15 minutes of completion of a test would contain the requisite amount of pressure necessary to pass the test than a tire tested at closer to 1 hour after completion of the test.

The agency conducted experiments at VRTC concerning post-testing pressure measurements. These tests indicated tires require longer than 15 minutes for the pressure inside of them to stabilize after a performance tests and that a span of 1 hour after testing provides sufficient time to allow cooling of the tire and stabilization of its internal pressure. Measurements taken before the end of the 1-hour period may be artificially high and mask test induced pressure losses due to the heat generated in the tire during testing. Additionally, the agency's confirmation testing at STL indicated that a tire's inflation pressure requires substantially more than 15 minutes to stabilize after testing is completed. This testing revealed that the inflation pressure decreased an average of 6–8 psi (the pressure decrease ranged from 5–12 psi) between 15 minutes and 1 hour after completion of testing in both P-metric and LT tires.

In response to RMA's suggestion and based upon our own analysis of available data, the agency has decided to require that all post-test pressure measurements be taken at least one hour after the test is completed. The agency has determined that a 1-hour period provides a sufficient time period for tire cooling and would prevent superficially high tire temperatures from masking test-induced pressure losses that would not be detectable at an earlier measurement marker.

D. Tire Selection Criteria/De-Rating of P-metric Tires

Commenters expressed a range of sentiments on these issues. Tire industry commenters strongly supported retaining the de-rating percentage of 1.10 for P-metric tires used on non-passenger car vehicles, and the proposal to revise FMVSS No. 110 to require determination of normal load based on 85% of the load at the vehicle placard pressure.

The vehicle industry commenters supported the extension of FMVSS No. 110 applicability to light trucks, MPVs and vans under 10,000 GVWR, but urged the agency to retain the vehicle normal load at 88% of the maximum load rating. The Alliance also suggested that the agency de-link the tire selection criteria from the load parameter used in the high-speed test, saying that no rationale exists for the linkage. While the Alliance stated that revising the load reserve requirement would affect areas of vehicle performance, such as braking and CAFE, and would require some redesign of vehicle systems and components, they did not provide specific data to support these assertions. GM stated that 22% of its car and 6% of its light truck volumes would not comply with the proposed tire selection criteria. Subaru also indicated that a significant percentage of its fleet would need to be altered to meet the proposals.

Consumer group commenters suggested that the agency require a higher reserve load, between 18 and 20 percent because they believe that 15% does not adequately address typical loading conditions for trucks and heavier vehicles.

Tire reserve load currently refers to a tire's remaining load-carrying capabilities when the tire is inflated to the tire manufacturer's maximum cold inflation pressure shown on the tire sidewall and the vehicle is loaded to its gross vehicle weight rating (GVWR). A reserve load is provided by vehicle manufacturers, as per the requirements of FMVSS No. 110, to account for overloading of the vehicle, under-inflation of tires, or both. The load reserve margin required by FMVSS No. 110 is linked with the load parameter in the FMVSS No. 109 high-speed test. The load parameter for the proposed high speed test was 85% percent of the maximum load as labeled on the tire.

The primary purpose of FMVSS No. 110 is to specify requirements for tire selection to prevent tire overloading. Since the standard is a vehicle-based standard, the tire selected for each vehicle to which the standard applies is based on the load limits for the tire and the maximum vehicle weight. The maximum load rating (in lbs or kg) for a tire is currently determined at the maximum inflation pressure of 240 kPa (35 psi) for standard load P-metric tires. If the vehicle manufacturer, however, chooses to recommend an inflation pressure (labeled on the placard) lower than the maximum inflation pressure, the actual rated load is lower than that maximum rated load (based on maximum inflation pressure) because the tire load rating decreases with a lower inflation pressure.[34]

The agency believes that the actual rated load is a more appropriate measure of load reserve than the maximum rated load. The purpose of FMVSS No. 110 is to prevent the overloading of a tire as installed on a vehicle, not on the tire in the abstract. The agency has concluded, therefore, that the most appropriate way for the vehicle manufacturer to determine the reserve load for the tire on the vehicle is to determine the load at recommended inflation pressure (as labeled on the placard), not at the maximum inflation pressure on the tire sidewall, since few, if any, vehicle manufacturers list the maximum inflation pressure as their recommended inflation pressure.

However, if FMVSS No 110 were revised as proposed in the NPRM, vehicle manufacturers would be required to increase the reserve load from 12 percent to 15 percent on their vehicles. Additionally, the margin would, in fact, need to be made larger because the vehicle normal load would be based on the load rating at the vehicle's placard pressure rather than the load rating at the maximum inflation pressure of the tire.

The agency proposed an 85% figure, stating that increasing the tire reserve needed by a vehicle under normal loading conditions from 12 to 15 percent would result in a larger margin of safety when a vehicle is loaded to its GVWR or its tires are underinflated. Based on comments and further analysis, the agency believes that 85% figure combined with the load reserve being based on the load rating at placard pressure rather than at maximum inflation pressure is insufficiently justified at this time. Currently, the agency does not have any data that links reserve load to tire failure. The most recent data we have on this issue was analyzed in a 1981 study. That study found no correlation between reserve load and tire failure. Further, the proposed reserve load increase would have necessitated the vehicle manufacturers' making major changes in the design of some of their vehicles to comply with the requirement.[35] For instance, some vehicle manufacturers for some vehicles would have had to ''plus'' size the tires on their vehicles, which could, in turn, have necessitated a redesigning of other vehicle systems such as the suspension and braking systems.

In response to the vehicle manufacturers' concerns, we have decided to de-link the tire selection criteria from the load used in the high-speed test. The agency believes that if it were to require that the vehicle normal load at placard pressure be no greater than the figure specified for the load parameter in the high speed test, 85%, too many vehicles would need a costly[36] tire upsize to comply with requirements that do not, based on all currently available data, appear to provide safety benefits. Further, the agency is not aware of any safety rationale to continue to link the load

[34] For example, if 2 similar vehicles (similar GVWR and weight distribution) are equipped with the same tires size but the first has a placard pressure of 32 psi and the other a placard pressure of 26, psi, based on our current requirement, the reserve load will be identical for both vehicles. However, if the reserve load is based on placard pressure, then the vehicle with the higher placard pressure will have a higher load rating and load reserve than the vehicle with the lower placard pressure since the load rating increases with increased inflation pressure.

[35] In the FRE, the agency estimates that, based on available compliance data, 6 of 14 light vehicles would have failed the 85% lead reserve requirement. These data are discussed in more detail in the FRE.

[36] The cost of tire upsizing is discussed in greater detail in the FRE.

reserve requirements with the loading parameter in the high-speed test.

For passenger cars and for non-passenger car vehicles equipped with LT tires, the final rule requires that the vehicle normal load be based on 94% of load rating at the vehicle's placard pressure. Therefore, vehicle manufacturers will be required to insure that the tire reserve load corresponds with the tire's load carrying capabilities when the tire is inflated to the vehicle manufacturers recommended cold tire inflation pressure rather than the tire manufacturer's maximum cold inflation pressure shown on the tire sidewall. The 94% figure was chosen to approximate closely the load reserve that results from the current requirement of 88% based of load rating at the tire's maximum inflation pressure.

By specifying an 94% value based on vehicle normal load, the agency is addressing the vehicle industry's concerns that a significant number of vehicles would otherwise need to be redesigned to accommodate larger tire sizes, while aiming to reflect more accurately actual vehicle loading conditions of vehicles by requiring that each vehicle manufacturer select the appropriate reserve load for that vehicle. The agency has recently conducted a FMVSS No. 110 vehicle normal load evaluation and has concluded that almost all light vehicles could meet a revised criteria for load reserve based on 94% of placard pressure with only a minor increase, *e.g.*, 1 or 2 psi, in this listed inflation pressure to accommodate the new requirement. Because 1 or 2 psi does not have a meaningful effect on the ride, comfort and, consequently, the marketability of a vehicle, this provision should impose little or no cost on the industry.

For the final rule, the agency has also decided to retain the de-rating factor of 1.10 for P-metric tires used on non-passenger car vehicles. For non-passenger car vehicles equipped with P-metric tires, the vehicle normal load shall be not greater than the derated value of 94% of the tire load rating at the vehicle's placard pressure. This de-rating provides a greater load reserve when these tires are installed on vehicles other than passenger cars. For the first time, this final rule requires light trucks to have a specified tire reserve, the same as for passenger cars, under normal loading conditions.

The agency has decided to retain the de-rating factor for P-metric tires used on MPVs, trucks, and buses in part in response to widespread support from commenters. Additionally, the agency continues to believe that the premise behind the 10 percent de-rating of P-metric tires remains valid today. This premise is that the reduction in the load rating is intended to provide a safety margin for the generally harsher treatment, such as heavier loading and possible off-road use, that passenger car tires receive when installed on a MPV, truck, bus or trailer, instead of on a passenger car.

The final rule adopts an expanded Table 1 text for occupant loading and distribution for designated seating capacities up to 22 occupants.

E. Applicability and Effective Dates

The requirements adopted by this rule apply, except where specified below, to new pneumatic radial tires for use on motor vehicles with a GVWR of 10,000 pounds or less, manufactured after 1975, except for motorcycles and LSVs, and for new motor vehicles with a GVWR or 10,000 pounds or less.

Given the increasing consumer preference for using light trucks for passenger purposes, the agency is requiring that the tire performance requirements for passenger car tires also apply to LT tires (load C, D, and E) used on light trucks. No commenters disagreed with the agency's statement in the NPRM that LT tires are increasingly utilized in the same manner as P-metric tires on light vehicles or with the agency's statement that the use of these tires on passenger vehicles will continue to increase in the near future.

Several commenters suggested that certain tires produced for specialty uses or antique vehicles be excluded from adhering to the new performance requirements. RMA suggested that the agency exclude temporary spares, various trailer tires, snow and deep lug tires, and bias tires from the applicability of FMVSS No. 139. The TRA asked that special-use tires such as ST, FI, and 8–12 rim diameter and below tires (typically used on smaller, towed trailers) be excluded from FMVSS No. 139 and continue to be covered by FMVSS No. 109. Specialty Tires and CU argued that bias ply tires should continue to be regulated under FMVSS No. 109, not FMVSS No. 139 because the agency did not conduct any testing of these tires under the proposed parameters, they may not pass the new tests, and they are not part of the group of tires targeted by the TREAD Act to be upgraded. Hoosier Tires and Denman, makers of small lot specialty tire of both bias and radial design (15,000) per year suggest that limited production tires continue to be covered by FMVSS No. 109 and not become subject to the requirements of FMVSS No. 139.

The agency emphasizes that it is not changing the ''on-road'' versus ''off-road'' definition in this rulemaking. It also notes that specialty tire manufacturers are currently required to subject their ''on-road'' light vehicle tires to the performance tests in FMVSS No. 109 and 119.

The agency is aware of several manufacturers, such as Denman and Hoosier, which produce bias tires for racing, off-road, and antique/classic car applications. These tires represent a very small (less than 1 percent) segment of the market for light vehicle tires and are not offered by any vehicle manufacturer on any new light vehicle sold in the U.S. Further, the number of miles that they are driven per year on highways is insignificant. Therefore, the agency has decided to exclude bias, ST, FI, and 8–12 rim diameter tires from FMVSS No. 139. These tires, however, will continue to be covered by FMVSS No. 109 and 119. FMVSS No. 109 will not be deleted.

The agency, however, has decided that FMVSS No. 139 will be applicable to all radial P-metric and LT tires load ranges C, D, and E, produced for light vehicles manufactured after 1975, even specialty radial tires made in small lots or in limited production. Radial snow tires and other deep tread tires are also required to comply with FMVSS No. 139. Limited production, snow, and deep tread radial tires are operated on the same roads as mass produced P-metric tires and the agency believes that they should be capable of the same level of performance under comparable conditions. Further, the number of miles that they are driven per year on highways is believed to be greater than the number of on-road miles for the bias tires discussed in the immediately preceding paragraph. Retread tires will continue to be covered by FMVSS No. 117 and non-pneumatic spare tires will continue to be covered by FMVSS No. 129.

Most tire manufacturer and vehicle manufacturer commenters requested a longer lead-time than the two alternative implementation schedules proposed in the NPRM. The agency has decided to establish an effective date for implementation of both tire and vehicle requirements of 4 years after the date of publication of the final rule. The proposed implementation schedules in the NPRM reflected NHTSA's desire for expedited action on this issue. In view of the comments received by the tire and vehicle industry and the significance of the tire and vehicle design and production changes that may occur as a result of these new requirements in area not substantively revised in 30 years, NHTSA finds that an effective date of June 1, 2007, is reasonable and in the public interest.

RMA suggested a 5-year lead-time. The Alliance suggested a September 1, 2007, effective date. Both urged that tire and vehicle modifications would require this time period to assure compliance and successful matching of the high number of tires and vehicles affected by this rule. Consumer groups, however, suggested a faster implementation schedule for both P-metric and LT tires, with CU urging that implementation begin in September 1, 2002.

For both tires and vehicles, the agency has decided to extend the effective date to June 1, 2007. This extension of the effective date reflects the reality that tire manufacturers will need to modify tire design and production to accommodate changes in materials, compounds and construction as well as respond to any revised aspects of vehicle design initiated by this final rule. It also recognizes that the vehicle manufacturers will, in response to the altered materials/compounds or constructions of tires, need to effect design changes to revalidate/redesign vehicle characteristics such as braking, handling, fuel consumption, and that some of this work can only be accomplished subsequent to the design and production changes initiated by the tire manufacturers. NHTSA believes that 4 years is in the public interest because it is need to provide sufficient lead-time for tire manufacturers and vehicle manufacturers to make necessary design and production changes for their tires and vehicles to comply with the new requirements.

Finally, to encourage the earliest possible application of the new tire performance and vehicle requirements, NHTSA is allowing manufacturers to implement the new requirements before the required dates.

F. Other Issues

1. Modification to FMVSS Nos. 110 and 120

The purpose of FMVSS No. 110 and 120 is to provide safe operational performance by ensuring that vehicles to which they apply are equipped with tires of adequate load rating and rims of appropriate size and type designation. Until recently, FMVSS No. 110 applied to passenger cars and FMVSS No. 120 applied to vehicles other than passenger cars including motorcycles and trailers.

The Tire Information final rule specified that the applicability of FMVSS Nos. 110 and 120 would correspond with the applicability of the new light vehicle tire standard, FMVSS No. 139. FMVSS No. 110, in its entirety, now applies to light vehicles with a GVWR of 10,000 pounds or less, except motorcycles and low-speed vehicles. FMVSS No. 120 will only apply to vehicles over 10,000 pounds GVWR and motorcycles.

As discussed above in the Tire Selection Criteria/Load Limits section, the load reserve requirement contained in FMVSS No. 110, under its new applicability, has now been extended to cover MPVs, vans, trailers and pickup trucks for the first time. This load requirement, however, has been de-linked from the load specified for the high speed test. This means that P-metric and LT tires used on these vehicles are required to have a load reserve similar to that for P-metric tire used on passenger cars.

The agency has also decided to extend S4.4.1(b) of FMVSS No. 110 to light trucks and vans for the first time. S4.4.1(b) requires that each rim retain a deflated tire in the event of a rapid loss of inflation pressure from a vehicle speed of 97 km/h until the vehicle is stopped with a controlled braking operation. No commenter responded to this issue.

2. Modification to FMVSS Nos. 117 and 129

FMVSS No. 117 specifies performance requirements for retreaded pneumatic passenger car tires and FMVSS No. 129 specifies performance requirements for new non-pneumatic tires for passenger cars. FMVSS No. 117 specifies that retreaded tires shall comply with the FMVSS No. 109 strength and resistance-to-bead unseating tests and FMVSS No. 129 specifies that its tire strength and high-speed specifications mirror those of FMVSS No. 109. The agency proposed that, to maintain consistent testing procedures and requirements for all tires for use on light vehicles, the strength and resistance to bead-unseating test procedures in FMVSS No. 117 would be replaced with the proposed road hazard and bead unseating tests in FMVSS No. 139 and, similarly, the strength and high speed test procedures and requirements in FMVSS No. 129 would be revised to mirror those proposed for FMVSS No. 139. To retain consistency with the applicability of FMVSS No. 139, the agency also proposed to revise the applicability of FMVSS Nos. 117 and 129 to include retreaded and non-pneumatic tires, respectively, for use on motor vehicles with a GVWR of 10,000 pounds or less, manufactured after 1975, except for motorcycles.

Several commenters objected to the agency adopting the proposed test road hazard and bead unseating tests for retreaded tires. For instance, ITRA and TANA argued that the proposed tests are redundant since the retread process does not affect the structure of the original casing of the tire. No comments were received on the proposed revision to FMVSS No. 129 or the revised applicability for both standards.

The agency had decided not to adopt the revised applicability provisions of FMVSS No. 117 and 129 as proposed in the NPRM. Given that the construction of retreaded tires and non-pneumatic tire/wheel assemblies would be different for other light vehicles than for passenger cars and the agency has not conducted any research or testing in this area, it needs to better understand the performance and safety implications of this proposal before its institution.

Because the agency is retaining the strength and road hazard requirements of FMVSS No. 109 for FMVSS No. 139, it has also decided to retain these requirements for FMVSS Nos. 117 and 129. This decision will impose no new requirements on tire retreaders. Retreaders will continue to be required to follow the same procedures and fulfill the same requirements that have been required under FMVSS No. 117. Similarly, non-pneumatic tires will be subject to the same performance requirements for strength testing that have existed up to the present.

Additionally, FMVSS No. 129 will incorporate by reference the high speed and endurance tests in FMVSS No. 109 rather than adopting those in FMVSS No. 139. The agency has elected to retain these tests because, due to the limited time frame for this rulemaking, it was unable to evaluate the effect of the new, more stringent high speed and endurance parameters on FMVSS No. 129 tires to the new high speed and endurance tests.

The intent of the agency in this rulemaking has been to focus on mainstream passenger vehicle tires, OE and replacement pneumatic radial tires, which represent over 95% of the market. The agency intends to reexamine the applicability of FMVSS Nos. 117 and 129, as well as testing FMVSS Nos. 117 and 129 tires to the new high speed and endurance parameters at a future time. After the agency completes its research on aging, bead unseating, and road hazard impact, and makes its rulemaking decisions based on that research, NHTSA will then consider whether to incorporate any new or revised procedure into FMVSS Nos. 117 and 129.

3. Shearography Analysis

The agency solicited comments on the use of shearography analysis for post-test tire inspection purposes. Commenters, except for the consumer groups, generally believe that shearography is a beneficial laboratory research tool but is not sufficiently developed to use to determine pass/fail criteria for a regulation. According to the Alliance, correlations between physical indications of possible tire structural degradation observed by means of shearography and subsequent tire failures have not been validated to the level of certainty that is requisite to establish pass/fail criteria in a FMVSS. RMA stated that the technology requires a very highly skilled operator/interpreter and that even the slightest degree of incipient belt separation in the tire at the conclusion of the tests does not mean imminent tire failure under on-the-road usage that would require interpretation which may vary and may be highly subjective. PC and CU argue that visual inspection is inadequate and that shearography could be used to supplement visual inspection to ensure that interior tire damage does not go undetected.

Based on the comments and the agency's understanding of shearography analysis, NHTSA agrees with the tire and vehicle manufacturers that shearography analysis is not sufficiently developed enough at present to be used to distinguish pass/fail criteria in our performance tests. Therefore, the agency is not adopting shearography analysis for any post-test inspection, but will continue utilizing it in conjunction with its tire research and may pursue it as an inspection method for tires in its regulatory regime at some future time.

4. Revision of UTQG

The agency solicited comments on whether, based on the proposed high speed test speed steps, there is a need to revise the grades and testing speeds specified in the UTQG Temperature Grading Requirement.

RMA supports no revision to the UTQGS scope and testing conditions at present. ETRTO suggested that the UTQG rating is useless since tires are labeled with the Speed Symbol, which indicates a tire's capability to resist high temperatures. Public Citizen urged the agency to retain the UTQG ratings instead of replacing it with the speed rating system because the speed rating system does not address a tire's treadwear and traction capabilities.

The agency appreciates that range and diversity of comments received in response to the request for comments on this issue in the NPRM. The agency will take these comments and the issues contained therein into consideration if and when we address the effectiveness of the temperature grading, specifically, and/or the entire UTQGS, more generally, in a future rulemaking.

5. Analysis of Responses to Agency Questions in NPRM

The agency presented the following italicized questions for public comment in the NPRM.

Are there any voluntary consensus standards or requirements of other countries or regions which address the issues raised in this NPRM?

The Alliance, ETRTO, RMA, GRRF, and Center for Regulatory Effectiveness (CRE) advocate the adoption of an ECE R30 type test, such as GTS–2000 or proposed GTR. The RMA and CRE have asked that NHTSA reconsider its decision to propose a government-unique standard in light of its obligations under the Technology Transfer Act and OMB Circular A–119. More specifically, the CRE asked NHTSA to consider the following voluntary consensus standards—ISO 10191, SAE J1561, and SAE J1633/ISO 10454.

In the NPRM, NHTSA stated the following:

> G. National Technology Transfer and Advancement Act
>
> Under the National Technology and Transfer and Advancement Act of 1995 (NTTAA) (Pub. L. 104–113), ''all Federal agencies and departments shall use technical standards that are developed or adopted by voluntary consensus standards bodies, using such technical standards as a means to carry out policy objectives or activities determined by the agencies and departments.'' Certain technical standards developed by the Society of Automotive Engineers (SAE) and other bodies have been incorporated into this proposal but the overall need for safety precludes, in NHTSA's view, the adoption of such voluntary standards as a substitute for this proposal for several reasons. First, no one voluntary standard contains all six of the proposed test procedures and requirements in this proposal. Second, voluntary consensus standards do not exist for several of the test procedures and requirements in the agency's proposal. Third, while the testing conditions and procedures of some voluntary standard have been incorporated by reference into the agency's proposal, the specified performance requirements of the voluntary standards are either different than those specified in our proposal or are non-existent.

Under the NTTAA and OMB Circular A–119, NHTSA is required to consider the adoption of standards developed by a voluntary consensus body. To be considered such a voluntary consensus standards body under the NTTAA, a body must be a *private* sector one. The agency considered two standards developed by such a body, SAE: The SAE J1981 Road Hazard Test and the SAE J1561 high speed test. The SAE J1561 high speed test is based on a speed rating methodology similar to GTS–2000, proposed/model GTR, and ECE R30. Similarly, SAE J1633/ISO 10454 is the LT tire version of the SAE J1561 test that uses the same test methodology as the SAE J1561 tests to establish test speeds.[37] The ISO 10191 test is merely a combination of current FMVSS No. 109 and ECE R30. More specifically, it includes the endurance test, bead unseating, and strength tests from FMVSS No. 109 and the high speed test from ECE R30. Therefore, it is no more stringent than the current FMVSS No. 109 tests and the ECE R30 tests, both of which are discussed in section VI.C. of this document. The rationale for why we have not adopted the voluntary consensus standards suggested by CRE is stated above in section VI.C. Although neither the ECE R30 high speed test, nor the proposed/model GTR and GTS–2000 high speed tests were developed by voluntary consensus standards bodies, we did evaluate them when developing our proposal and adopting the final rule. The reasons we did not adopt these high speed tests and their methodology are set forth in section VI.C. Additionally, we are not adopting the SAE road hazard test for the reasons stated above in section VI.C.

Advocates suggests that the optional wet grip test being developed by WP.29 should be considered for the standard. The agency notes that this test was neither proposed nor discussed in the NPRM. Further, the agency has not analyzed crash data to see what, if any, safety benefits would accrue from a wet grip requirement.

The agency seeks comments on whether practicable and repeatable ''real-world'' testing procedures, conditions, specifications exist and whether they could be utilized as part of a minimum performance standard?

No comments were received suggesting ''real-world'' testing procedures, conditions, or specifications.

The agency seeks comments on the appropriateness of specifying the vehicle model year 1975 as a limitation

[37] The first two speed steps of SAE J1633/ ISO 10454 utilize test speeds that are extremely low, 12 mph and 18 mph, and the final speed is the rated speed for 30 minutes. The inflation pressure utilized during the test is pressure at maximum load, which is typically the maximum inflation pressure of the tire.

on the applicability of the proposed standard?

One commenter, GRRF, supported 1975 as cut-off date for the new tire standard and suggested the retention of FMVSS No. 109 for tires for earlier vehicles. The applicability for FMVSS Nos. 109 and 139 established by this final rule mirrors this suggestion, since both seem reasonable.

The agency seeks comment on whether the four required inflation pressures in FMVSS No. 109 should be retained in English units in the proposed standard and/or only be specified in metric units?

Currently, FMVSS No. 109 specifies that a tire's maximum permissible inflation pressure shall be 32, 36, 40, or 60 psi, or 240, 280, 300, 340, or 350 kPa. The 32, 36, 40, and 60 psi figures were originally based on bias ply tire specifications, and are not the English equivalents of the metric listing of maximum permissible inflation pressure values, 240, 280, 300, 340, and 350 kPa, established for and used on radial tires.

RMA supports retaining the 32, 36, 40, and 60 psi specifications in FMVSS No. 109 but not including them in FMVSS No. 139. The Alliance, on the other hand, suggested including the figures in the new standard but formatting them so that they would be specified in metric units followed by the English equivalent in parentheses.

Based on the agency's decision to retain the requirements for bias ply tires under FMVSS No. 109, FMVSS No. 139 will contain a listing of only 240, 280, 300, 340, and 350 kPa as maximum permissible inflation pressures. As required in S5.5.4(a) of FMVSS No. 139, tires are required to be labeled with the maximum inflation pressure value in metric followed by the equivalent psi in parenthesis.

6. Other

RMA suggests that NHTSA adopt the tolerances listed in ASTM–F–551 Standard Practice for Using a 67.23-in. (1.707-m) Diameter Laboratory Test Wheel in Tire Testing. NHTSA will consider this suggestion in its tire testing.

RMA suggests that NHTSA should adopt a specific tire pressure reserve limit and comments that they will be petitioning the agency for such a ruling in the near future. Since the time that RMA submitted this comment, it has petitioned the agency for a rulemaking to adopt a tire pressure reserve limit. The agency is currently evaluating the petition and the practicability of initiating such a rulemaking.

VII. Benefits

For a fuller discussion of the benefits, see the agency's Final Regulatory Evaluation (FRE). A copy of the FRE has been placed in the docket.

The final rule will increase the strength, endurance, and heat resistance of tires by raising the stringency of the existing standard on endurance and high speed tests and by requiring a low pressure performance test. The agency anticipates that tires that meet these tests will experience fewer tire failures. Based on the tires tested by the agency and tire tests provided by RMA, the agency estimates that 2 to 3 percent will fail the new high speed test, 2 to 3.5 percent will fail the new endurance test, and 0–6 percent will fail the low pressure test. In total, 5 to 11 percent of tires currently will not pass the adopted tests.

As discussed in the FRE, we estimate a target population, 414 fatalities and 10,275 non-fatal injuries annually, for tire problems (flat tire/blowout). However, the agency does not know how many of these crashes are influenced by tire design or under-inflation. The agency assumes that under-inflation is involved in 20 percent of flat tire/blowout cases that resulted in a crash. The agency assumes that the influence that under-inflation has on the chances of a blowout is affected by both tire pressure and the properties of the tire. Therefore, the agency assumes that proper inflation will address 50 percent of these cases and improved tires will address the other 50 percent of these cases. Consequently, 41 fatalities ($414 \times .2 \times .5$) and 1,028 injuries are addressed by the TPMS final rule. This leaves the target population for this proposal at 373 fatalities and 9,247 injuries.

We assume a 5–10 percent reduction in flat tire/blowouts for making improvements to those tires not passing the tests. Thus, the total potential improvement would be 19 to 37 lives saved (373 * .05 to .10) and 462 to 925 (9,247 * .05 to .10) injuries avoided if only those tires in the target population were the ones that needed improvements. For those tires currently not passing the adopted tests (5 to 11 percent), the benefits will be 1 to 4 lives saved (19 * 0.05 to 37 * 0.11) and 23 to 102 injuries reduced (462 * .05 to 925 * .11) when all tires on the road meet the adopted requirements.

VIII. Costs

The following is a summary of the costs associated with the performance requirements contained light vehicle tire standard. It is based on the increased stringency of the high speed and endurance tests and the addition of a low inflation pressure performance test.

A. Original Equipment Tire and Vehicle Costs

The adopted tests will result in tires being designed that are less susceptible to heat build-up. For the proposed requirements, the agency believed that many, if not all, of the P-metric tires rated C for Temperature resistance and some LT tires will not be able to pass the new tests. In the NPRM, the agency attempted to determine the difference in price between two tires that appear be similar in all characteristics except that one tire is rated B for temperature resistance while the other is rated C. The agency estimated that the difference in price between a B or C-rated tire that might fail the proposed standard and a B-rated tire that will pass the proposed standard is $3 per tire (in 2001 dollars) and that the cost differential for a vehicle model equipped with C-rated tires, depending on whether it had a full-size spare, was $12 to $15 per vehicle. No comments were received on these estimates.

The final rule contains different, less burdensome test parameters than those in the NPRM. The estimated failure rate for currently produced tires was 33% for the parameters in the NPRM. For the parameters adopted in this final rule, the rate is 5% to 11%. Additionally, the average tires that failed the tests in the final rule did so at a later point in the tests or failed during inspection after the tests were completed. This indicates that, in addition to the decreased failure rate, the degree of failure is less for tires that fail when tested to the parameters in the final rule as compared to those that failed when tested to the parameters in the NPRM. Therefore, the costs per failing tire should be less than our previous estimate of $3 per tire. We believe the incremental costs, on an average tire basis, are in the range of $0.25 to $1.00 per failing tire. Since we estimate that 5 to 11 percent of the current tires would fail the final rule requirements, the average cost is estimated to range from $0.01 per tire ($\$0.25 \times .05$) to $0.11 per tire ($\$1 \times .11$).

Since only a portion of new vehicles are equipped with tires that do not meet the final rule, the agency estimates the average price increase for new vehicles by weighting the vehicles that will receive improvements at $0.25 to $1 per tire with the vehicles whose tires and prices will not change.

The agency estimates that approximately 85 percent of light vehicles (passenger cars, pickups, SUVs, and vans) are sold with a temporary spare tire.[38] Thus, the average cost per vehicle for the new vehicle fleet will be \$1.04 (4 × \$0.25 × 0.85 + 5 × \$0.25 × .15) to \$4.15 (4 × \$1.00 × 0.85 + 5 × \$1.00 × 0.15). On an average vehicle basis, based on the current tires that fail the test, the average cost is \$0.05 per vehicle (1.04 × .05) to \$0.46 per vehicle (\$4.25 × .11).

In the NPRM, the agency sought comment on whether the proposal, if it resulted in the lowest priced new tires being taken off the market (tires rated C for Temperature resistance appear to be lowest priced tires), would affect the market of new vehicle and aftermarket tire sales by either (a) increasing the popularity of alternatives to conventional new tires, such as temporary spare tires for new vehicles, and retreads and used tires in the aftermarket, or (b) encouraging tire manufacturers to making tradeoffs in tire construction, *e.g.*, in traction, treadwear and rolling resistance, to improve the heat resistance of his tires. No commenters provided information on (a), but several tire manufacturers responded to (b) by indicating that tire manufacturers will need to alter design and/or construction attributes of their tires to comply with the proposed tests.[39] Based on the estimated failure rates for the testing parameters established in the final rule, the agency anticipates that the manufacturers will not need to invoke any strategies (*e.g.*, reducing amount of tread or tread depth to lower heat build-up) that may have deleterious implications for treadwear or wet traction ability of the tire.

Finally, the agency anticipates that its revision to the load reserve provisions of FMVSS No. 110 will impose no costs on either tire or vehicle manufacturers.

B. Total Annual Costs

The agency anticipates that between 5 percent and 11 percent of the combined sales of P-metric and LT tires will not pass the adopted tests. There are an estimated 287 million light vehicle tires sold of which 5 to 11 percent might increase in price by \$0.25 to \$1 per tire. The overall annual cost for new original equipment and replacement tires is estimated at \$3.6 million (287 million tires × .05 × \$0.25) to \$31.6 million (287 million tires × .11 × \$1) and the net costs per equivalent life saved will be about \$5 million based on the mid-point of cost and discounted benefits estimates.

We do not anticipate an increase in costs for the road hazard impact and bead unseating tests because our testing indicates that all current production tires pass these tests.

C. Testing Costs

The final rule is estimated to increase test costs by \$76.40 per tire model tested. With about 5,540 tire models tested annually, the incremental test costs are estimated to be \$423,000 per year.

The final rule will not require any new or different testing equipment than that currently used by tire manufacturers.

IX. Effective Date

NHTSA is requiring tire and vehicle manufacturers to begin compliance on June 1, 2007. The agency believes that it has shown good cause for a four-year leadtime in section VI.E. of this document.

X. Rulemaking Analyses and Notices

A. Executive Order 12866 and DOT Regulatory Policies and Procedures

Executive Order 12866, ''Regulatory Planning and Review'' (58 FR 51735, October 4, 1993), provides for making determinations whether a regulatory action is ''significant'' and therefore subject to Office of Management and Budget (OMB) review and to the requirements of the Executive Order. The Order defines a ''significant regulatory action'' as one that is likely to result in a rule that may:

(1) Have an annual effect on the economy of \$100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or Tribal governments or communities;

(2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

(4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

NHTSA has considered the impact of this rulemaking action under Executive Order 12866 and the Department of Transportation's regulatory policies and procedures. This rulemaking document was reviewed by the Office of Management and Budget under Executive Order 12866, ''Regulatory Planning and Review.'' The rulemaking action was determined to be economically significant, as proposed. However, it is no longer economically significant. The rule is likely to result in an expenditure by automobile manufacturers and/or tire manufacturers of between \$3.6 and \$31.6 million in annual costs. The benefits are estimated to be 1–4 lives saved and 23–102 injuries reduced. NHTSA is placing in the public docket a FRE describing the costs and benefits of this rulemaking action. The costs and benefits are summarized earlier in this document.

B. Regulatory Flexibility Act

The Regulatory Flexibility Act of 1980 (5 U.S.C. 601 *et seq.*) requires agencies to evaluate the potential effects of their proposed and final rules on small business, small organizations and small governmental jurisdictions. I hereby certify that the final rule will not have a significant impact on a substantial number of small entities.

The final rule will affect motor vehicle manufacturers and tire manufacturers and/or suppliers. The agency, based on comments received to the NPRM, believes that three specialty tire manufacturers may be small businesses. However, we anticipate that the increase in price per tire for these manufacturers as a result of this final rule will have no real impact as they will pass on these prices to consumers.

There are thousands of small tire retail outlets that will in some small way be impacted by this rule. As mentioned earlier, increasing the price of the less expensive tire could potentially allow used tires and retread tires to make more inroads into the tire retail business. This may impact small businesses. At this time, it is unknown whether the impacts will be insignificant and just an increase in price to consumers, or whether there will be some competitive effects brought about by the price increase.

NHTSA estimates that there are only about four small passenger car and light truck vehicle manufacturers in the United States. These manufacturers serve a niche market. The agency believes that small manufacturers manufacture less than 0.1 percent of total U.S. passenger car and light truck production per year.

NHTSA notes that final stage manufacturers and alterers could also be affected by this rule. Many final stage manufacturers and alterers install supplier manufactured tires in vehicles they produce. The final rule will not have any significant effect on final stage manufacturers or alterers, however,

[38] Temporary spare tires are not covered by the final rule.

[39] To affect such a tradeoff, a tire manufacturer could alter the design construction of the core of the tire or could reduce the amount of tread on the tire. When one lessens the amount of tread on a tire, one lowers the heat build-up that occurs in the tire.

since the tires they purchase should be tested and certified by the tire manufacturer and the potential cost impacts associated with this action should only slightly affect the price of new motor vehicles and replacement tires.

Additional information concerning the potential impacts of the requirements on small entities is presented in the FRE.

C. National Environmental Policy Act

NHTSA has analyzed this final rule for the purposes of the National Environmental Policy Act. The agency has determined that implementation of this action would not have any significant impact on the quality of the human environment.

D. Executive Order 13132 (Federalism)

The agency has analyzed this rulemaking in accordance with the principles and criteria contained in Executive Order 13132 and has determined that it does not have sufficient federal implications to warrant consultation with State and local officials or the preparation of a federalism summary impact statement. The final rule will not have any substantial impact on the States, or on the current Federal-State relationship, or on the current distribution of power and responsibilities among the various local officials.

E. Unfunded Mandates Act

The Unfunded Mandates Reform Act of 1995 requires agencies to prepare a written assessment of the costs, benefits and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local or Tribal governments, in the aggregate, or by the private sector, of more than $100 million annually (adjusted annually for inflation with base year of 1995). Adjusting this amount by the implicit gross domestic product price deflator for the year 2000 results in $109 million (106.99/98.11 = 1.09). The assessment may be included in conjunction with other assessments, as it is here.

This rule is not estimated to result in expenditures by State, local or tribal governments of more than $109 million annually. However, it is likely to result in the expenditure by automobile manufacturers and/or their tire manufacturers of more than $109 million annually. The average costs estimate in this analysis is $3 per tire. Estimating that 32.8 percent of 287 million light vehicle tires sold annually (including new vehicle tire sales and aftermarket tires sales but excluding temporary spare tires) results in $3.6 to $31.6 million in annual costs. These effects have been discussed in the FRE.

F. Civil Justice Reform

This final rule will not have any retroactive effect. Under 49 U.S.C. 21403, whenever a Federal motor vehicle safety standard is in effect, a State may not adopt or maintain a safety standard applicable to the same aspect of performance which is not identical to the Federal standard, except to the extent that the State requirement imposes a higher level of performance and applies only to vehicles procured for the State's use. 49 U.S.C. 21461 sets forth a procedure for judicial review of final rules establishing, amending or revoking Federal motor vehicle safety standards. That section does not require submission of a petition for reconsideration or other administrative proceedings before parties may file suit in court.

G. National Technology Transfer and Advancement Act

Under the National Technology and Transfer and Advancement Act of 1995 (NTTAA) (Pub. L. 104–113), ''all Federal agencies and departments shall use technical standards that are developed or adopted by voluntary consensus standards bodies, using such technical standards as a means to carry out policy objectives or activities determined by the agencies and departments.'' Certain technical standards developed by the Society of Automotive Engineers (SAE) and other bodies have been considered in the formulation of these requirements, but the overall need for safety improvements precludes, in NHTSA's view, the adoption of such voluntary standards as a substitute for this rule. Voluntary consensus standards do not exist for several of the test procedures and requirements in the agency's rule. The voluntary consensus standards suggested by some commenters, such as the CRE, only address the high speed and road hazard impact aspects of tire performance. While these testing conditions and procedures in pertinent voluntary standards were considered for the agency's final rule, the specified performance requirements of the voluntary standards are either different than those specified in our final rule or are non-existent. Consideration and analysis of these standards are discussed in greater detail in section VI.C. of this document. Further, a more in-depth discussion of the agency's consideration of voluntary consensus standards or other foreign standards is contained in section VI.F.5. of this document.

H. Paperwork Reduction Act

This final rule contains the following ''collections of information,'' as that term is defined in 5 CFR part 1320 *Controlling Paperwork Burdens on the Public:*

Rim Labeling Requirements—The Department of Transportation is submitting the following information collection request to OMB for review and clearance under the Paperwork Reduction Act of 1995 (Pub. L. 104–13, 44 U.S.C. chapter 35).

Agency: National Highway Traffic Safety Administration (NHTSA).

Title: Tires and Rims Labeling, and Vehicle Placard Requirements.

Type of Request: Modification of an existing collection, for rim markings.

OMB Clearance Number: 2127–0503.

Affected Public: The rim-labeling respondents are manufacturers of rims.

Estimate of the Total Annual Reporting and Recordkeeping Burden Resulting from the Collection of Information: No change from current OMB clearance obtained by NHTSA in the year 2000, and has a current expiration date of December 31, 2003.

Estimated Costs: No change from current OMB clearance obtained by NHTSA in the year 2000, and has a current expiration date of December 31, 2003.

Summary of the Collection of Information: Each rim manufacturer must label their rim with the applicable safety information. These labeling requirements ensure that tires are mounted on the appropriate rims; and that the rims and tires are mounted on the vehicles for which they are intended. This requirement received its latest OMB clearance in the year 2000, and has a current expiration date of December 31, 2003.

The Transportation Recall Enhancement, Accountability, and Documentation (TREAD) Act of 2000 mandates a rulemaking proceeding to revise and update the safety performance requirements for tires. In response, NHTSA proposed a new Federal Motor Vehicle Safety Standard requiring all new tires for use on vehicles with a gross vehicle weight rating of 10,000 pounds or less to meet new and more stringent performance requirements. The new Federal Motor Vehicle Safety Standard (FMVSS) No. 139 is titled ''New pneumatic radial tires for light vehicles.'' Most SUVs, vans, trailers, and pickup trucks will be required to comply with the same tire selection and rim requirements as passenger cars. FMVSS No. 120

continues to apply to vehicles over 10,000 pounds GVWR and motorcycles.

To accommodate the vehicles equipped with tires that comply with FMVSS No. 139, FMVSS No. 110 will be re-titled ''Tire selection and rims for motor vehicles with a GVWR of 10,000 pounds or less'' and the current non-passenger rim marking requirements of FMVSS No. 120 will also be placed in FMVSS No. 110. These rim marking requirements mandate that each rim or, at the option of the manufacturer in the case of a single-piece wheel, each wheel disc shall be marked with the following: (1) The designation that indicates the source of the rim's published nominal dimensions, (2) the rim size designation, and in case of multipiece rims, the rim type designation, (3) the symbol DOT, constituting a certification by the manufacturer of the rim that the rim complies with all applicable Federal motor vehicle safety standards, and (4) a designation that identifies the manufacturer of the rim by name, trademark, or symbol, and (5) the month, day and year or the month and year of manufacture, expressed either numerically or by use of a symbol, at the option of the manufacturer.

Any manufacturer that elects to express the date of manufacture by means of a symbol shall notify NHTSA in writing of the full names and addresses of all manufacturers and brand name owners utilizing that symbol and the name and address of the trademark owner of that symbol, if any. The notification shall describe in narrative form and in detail how the month, day, and year or the month and year are depicted by the symbol. Such description shall include an actual size graphic depiction of the symbol, showing and/or explaining the interrelationship of the component parts of the symbol as they will appear on the rim or single piece wheel disc, including dimensional specifications, and where the symbol will be located on the rim or single piece wheel disc. The notification shall be received by NHTSA not less than 60 calendar days before the first use of the symbol. All information provided to NHTSA under this paragraph will be placed in the public docket. Each manufacturer of wheels shall provide an explanation of its date of manufacture symbol to any person upon request. Based on the facts that these are existing rim labeling requirements, and that they do not affect either the production or quantity of rims produced, NHTSA believes that this maintenance effort will not result in any net increase in the burden on those parties currently covered by existing regulations.

I. Plain Language

Executive Order 12866 requires each agency to write all rules in plain language. Application of the principles of plain language includes consideration of the following questions:

• Have we organized the material to suit the public's needs?

• Are the requirements in the rule clearly stated?

• Does the rule contain technical language or jargon that isn't clear?

• Would a different format (grouping and order of sections, use of headings, paragraphing) make the rule easier to understand?

• Would more (but shorter) sections be better?

• Could we improve clarity by adding tables, lists, or diagrams?

• What else could we do to make the rule easier to understand?

XI. Regulatory Text

List of Subjects in 49 CFR Part 571

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

■ In consideration of the foregoing, we are further amending 49 CFR part 571 as amended at 67 FR 69623 (November 18, 2002) and at 68 FR 33655 (June 5, 2003) and also in a final rule published elsewhere in this issue as follows:

PART 571—FEDERAL MOTOR VEHICLE SAFETY STANDARDS

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

Authority: 49 U.S.C. 322, 20111, 30115, 30166 and 30177; delegation of authority at 49 CFR 1.50.

■ 2. Section 571.109 is amended by revising its heading and by revising S2 to read as follows:

§ 571.109 Standard No. 109—New Pneumatic Bias Ply and Certain Specialty Tires.

* * * * *

S2. Application. This standard applies to new pneumatic radial tires for use on passenger cars manufactured before 1975, new pneumatic bias ply tires, and ST, FI, and 8–12 rim diameter and below tires for use on passenger cars manufactured after 1948. However, it does not apply to any tire that has been so altered so as to render impossible its use, or its repair for use, as motor vehicle equipment.

* * * * *

■ 3. Section 571.110 is amended by revising S2, S4.1, S4.2.1, S4.2.2, S4.4.1(a), and table 1 following S4.4.1(b), by adding S4.2.1.1, S4.2.1.2, S4.2.2.1, S4.2.2.2, S4.2.2.3, and S4.4.2 and by adding to S3 in alphabetical order, definitions for ''Rim diameter,'' ''Rim size designation,'' ''Rim type designation,'' ''Rim width,'' and ''Weather side,'' to read as follows:

§ 571.110 Standard No. 110; Tire selection and rims for motor vehicles with a GVWR of 4,536 kilograms (10,000 pounds) or less.

* * * * *

S2. Application. This standard applies to motor vehicles with a gross vehicle weight rating (GVWR or 4,536 kilograms (10,000 pounds) or less, except for motorcycles, and to non-pneumatic spare tire assemblies for those vehicles.

S3. Definitions

* * * * *

Rim diameter means nominal diameter of the bead seat.

Rim size designation means rim diameter and width.

Rim type designation means the industry of manufacturer's designation for a rim by style or code.

Rim width means nominal distance between rim flanges.

* * * * *

Weather side means the surface area of the rim not covered by the inflated tire.

* * * * *

S4.1. General. Vehicles shall be equipped with tires that meet the requirements of § 571.139, New pneumatic tires for light vehicles, except that passenger cars may be equipped with a non-pneumatic spare tire assembly that meets the requirements of § 571.129, New non-pneumatic tires for passenger cars and S6 and S8 of this standard. Passenger cars equipped with such an assembly shall meet the requirements of S4.3(e), and S5, and S7 of this standard.

* * * * *

S4.2.1 Tire load limits for passenger cars.

S4.2.1.1 The vehicle maximum load on the tire shall not be greater than the applicable maximum load rating as marked on the sidewall of the tire.

S4.2.1.2 The vehicle normal load on the tire shall not be greater than 94 percent of the load rating at the vehicle manufacturer's recommended cold inflation pressure for that tire.

S4.2.2 Tire load limits for multipurpose passenger vehicles, trucks, buses, and trailers.

S4.2.2.1 Except as provided in S4.2.2.2, the sum of the maximum load ratings of the tires fitted to an axle shall not be less than the GAWR of the axle system as specified on the vehicle's certification label required by 49 CFR part 567. If the certification label shows more than one GAWR for the axle system, the sum shall be not less than the GAWR corresponding to the size designation of the tires fitted to the axle.

S4.2.2.2 When passenger car (P-metric) tires are installed on an MPV, truck, bus, or trailer, each tire's load rating is reduced by dividing it by 1.10 before determining, under S4.2.2.1, the sum of the maximum load ratings of the tires fitted to an axle.

S4.2.2.3 (a) For vehicles equipped with P-metric tires, the vehicle normal load on the tire shall be no greater than the value of 94 percent of the derated load rating at the vehicle manufacturer's recommended cold inflation pressure for that tire.

(b) For vehicles equipped with LT tires, the vehicle normal load on the tire shall be no greater than 94 percent of the load rating at the vehicle manufacturer's recommended cold inflation pressure for that tire.

* * * * *

S4.4.1 * * *

(a) Be constructed to the dimensions of a rim that is listed by the manufacturer of the tires as suitable for use with those tires, in accordance with S4 of § 571.139.

(b) * * *

TABLE I.—OCCUPANT LOADING AND DISTRIBUTION FOR VEHICLE NORMAL LOAD FOR VARIOUS DESIGNATED SEATING CAPACITIES

Designated seating capacity, number of occupants	Vehicle normal load, number of occupants	Occupant distribution in a normally loaded vehicle
2 through 4	2	2 in front.
5 through 10	3	2 in front, 1 in second seat.
11 through 15	5	2 in front, 1 in second seat, 1 in third seat, 1 in fourth seat.
16 through 22	7	2 in front, 2 in second seat, 2 in third seat, 1 in fourth seat.

S4.4.2. Rim markings for vehicles other than passenger cars. Each rim or, at the option of the manufacturer in the case of a single-piece wheel, each wheel disc shall be marked with the information listed in paragraphs (a) through (e) of this S4.4.2, in lettering not less than 3 millimeters in height, impressed to a depth or, at the option of the manufacturer, embossed to a height of not less than 0.125 millimeters. The information listed in paragraphs (a) through (c) of this S4.2.2 shall appear on the outward side. In the case of rims of multi piece construction, the information listed in paragraphs (a) through (e) of this S4.2.2 shall appear on the rim base and the information listed in paragraphs (b) and (d) of this S4.2.2 shall also appear on each other part of the rim.

(a) A designation that indicates the source of the rim's published nominal dimensions, as follows:

(1) "T" indicates The Tire and Rim Association.

(2) "E" indicates The European Tyre and Rim Technical Organization.

(3) "J" indicates Japan Automobile Tire Manufacturers" Association, Inc.

(4) "L" indicates ABPA (Brazil), a.k.a. Associacao Latino Americana De Pneus E Aros.

(5) "F" indicates Tire and Rim Engineering Data Committee of South Africa (Tredco).

(6) "S" indicates Scandinavian Tire and Rim Organization (STRO).

(7) "A" indicates The Tyre and Rim Association of Australia.

(8) "I" indicates Indian Tyre Technical Advisory Committee (ITTAC).

(9) "R" indicates Argentine Institute of Rationalization of Materials, a.k.a. Instituto Argentino de Racionalización de Materiales, (ARAM).

(10) "N" indicates an independent listing pursuant to S4.1 of § 571.139 or S5.1(a) of § 571.119.

(b) The rim size designation, and in case of multipiece rims, the rim type designation. For example: 20 x 5.50, or 20 x 5.5.

(c) The symbol DOT, constituting a certification by the manufacturer of the rim that the rim complies with all applicable Federal motor vehicle safety standards.

(d) A designation that identifies the manufacturer of the rim by name, trademark, or symbol.

(e) The month, day and year or the month and year of manufacture, expressed either numerically or by use of a symbol, at the option of the manufacturer. For example: "September 4, 2001" may be expressed numerically as: "90401", "904, 01" or "01, 904"; "September 2001" may be expressed as: "901", "9, 01" or "01, 9".

(1) Any manufacturer that elects to express the date of manufacture by means of a symbol shall notify NHTSA in writing of the full names and addresses of all manufacturers and brand name owners utilizing that symbol and the name and address of the trademark owner of that symbol, if any. The notification shall describe in narrative form and in detail how the month, day, and year or the month and year are depicted by the symbol. Such description shall include an actual size graphic depiction of the symbol, showing and/or explaining the interrelationship of the component parts of the symbol as they will appear on the rim or single piece wheel disc, including dimensional specifications, and where the symbol will be located on the rim or single piece wheel disc. The notification shall be received by NHTSA not less than 60 calendar days before the first use of the symbol. The notification shall be mailed to the Office of Vehicle Safety Compliance (NVS–222), National Highway Traffic Safety Administration, 400 Seventh Street SW., Washington, DC 20590. All information provided to NHTSA under this paragraph will be placed in the public docket.

(2) Each manufacturer of wheels shall provide an explanation of its date of manufacture symbol to any person upon request.

* * * * *

■ 4. Section 571.119 is amended by revising its heading, S1, S2, S3, and tables I, II, and III to read as follows:

§ 571.119 Standard No. 119; New pneumatic tires for motor vehicles with a GVWR of more than 4,536 kilograms (10,000 pounds) and motorcycles.

S1. Scope. This standard establishes performance and marking requirements for tires for use on motor vehicles with a GVWR of more than 10,000 pounds and motorcycles.

S2. Purpose. The purpose of this standard is to provide safe operational performance levels for tires used on motor vehicles with a GVWR of more than 10,000 pounds, trailers, and motorcycles, and to place sufficient information on the tires to permit their proper selection and use.

S3. Application. This standard applies to new pneumatic tires designed for highway use on motor vehicles with a GVWR of more than 4,536 kilograms

(10,000 pounds), trailers, and motorcycles manufactured after 1948.

* * * * *

TABLE I.—STRENGTH TEST PLUNGER DIAMETER

	Plunger diameter (mm)	Plunger diameter (inches)
Tire type:		
Light truck	19.05	3/4
Motorcycle		5/16″
Tires for 12-inch or smaller rims, except motorcycle	19.05	3/4
Tires other than above types:		
Tubeless:		
17.5-inch or smaller rims	19.05	3/4
Larger than 17.5-inch rims:		
Load range F	31.75	1 1/4
Load range over F	38.10	1 1/2
Tube type:		
Load range F	31.75	1 1/4
Load range over F	38.10	1 1/2

TABLE II.—MINIMUM STATIC BREAKING ENERGY

[Joules (J)) and Inch-Pounds (inch-lbs)]

Load range / Tire characteristic / Plunger diameter (mm and inches)	Motorcycle 7.94J	Motorcycle 5/16"	All 12 rim diameter code or smaller rim size 19.05 J	All 12 rim diameter code or smaller rim size 3/4″	Light truck 17.5 rim diameter or smaller rim tubeless 19.05 J	Light truck 17.5 rim diameter or smaller rim tubeless 3/4″	Tube type 31.75 J	Tube type 1 1/4″	Tubeless J	Tubeless Inche-lbs	Tube type 38.10 J	Tube type 1 1/2"	Tubeless J	Tubeless Inche-lbs
A	16	150												
B	33	300												
C	45	400												
D														
E														
F			406	3,600	644	5,700	1,785	15,800	1,412	12,500				
G					711	6,300					2,282	20,200	1,694	15,000
H					768	6,800					2,598	23,000	2.090	18,500
J											2,824	25,000	2,203	19,500
L											3,050	27,000		
M											3,220	28,500		
N											3,389	30,000		

TABLE III.—ENDURANCE TEST SCHEDULE

Description	Load range	Test wheel speed (r/m)	Test load: Percent of maximum load rating I—7 hours	II—16 hours	III—24 hours	Total best revolutions (thousands)
Speed restricted service:						
88 km/h (55 mph)	F, G, H, J, L, M, N	125	66	84	101	352.0
80 km/h (50 mph)	F, G, H, J, L	100	66	84	101	282.5
56 km/h (35 mph)	All	75	66	84	101	211.0
Motorcycle	All	250	[1] 100	[2] 108	117	510.0
All other	F	200	66	84	101	564.0
	G	175	66	84	101	493.5
	H, J, L, N	150	66	84	101	423.5

[1] 4 hr. for tire sizes subject to high speed requirements (S6.3).
[2] 6 hr. for tire sizes subject to high speed requirements (S6.3).

■ 5. Section 571.120 is amended by revising its heading, S3, S5.1.1, S5.1.2, and S5.3 to read as follows:

§ 571.120 Standard No. 120; Tire selection and rims for motor vehicles with a GVWR of more than 4,536 kilograms (10,000 pounds).

* * * * *

S3. Application. This standard applies to motor vehicles with a gross vehicle weight rating (GVWR) of more than 4,536 kilograms (10,000 pounds and motorcycles, to rims for use on those vehicles, and to non-pneumatic spare tire assemblies for use on those vehicles.

S5.1.1 Except as specified in S5.1.3, each vehicle equipped with pneumatic tires for highway service shall be equipped with tires that meet the requirements of § 571.119, New pneumatic tires for motor vehicles with a GVWR of more than 10,000 pounds, and rims that are listed by the manufacturer of the tires as suitable for use with those tires, in accordance with S5.1 of § 571.119, except that vehicles may be equipped with a non-pneumatic spare tire assembly that meets the requirements of § 571.129, New non-pneumatic tires for passenger cars, and S8 of this standard. Vehicles equipped with such an assembly shall meet the requirements of S5.3.3, S7, and S9 of this standard.

S5.1.2 Except in the case of a vehicle which has a speed attainable in 3.2 kilometers of 80 kilometers per hour or less, the sum of the maximum load ratings of the tires fitted to an axle shall be not less than the gross axle weight rating (GAWR) of the axle system as specified on the vehicle's certification label required by 49 CFR part 567.

Except in the case of a vehicle which has a speed attainable in 2 miles of 50 mph or less, the sum of the maximum load ratings of the tires fitted to an axle shall be not less than the gross axle weight rating (GAWR) of the axle system as specified on the vehicle's certification label required by 49 CFR part 567. If the certification label shows more than one GAWR for the axle system, the sum shall be not less than the GAWR corresponding to the size designation of the tires fitted to the axle. If the size designation of the tires fitted to the axle does not appear on the certification label, the sum shall be not less than the lowest GAWR appearing on the label. When a tire subject to FMVSS No. 109 or 139 is installed on a multipurpose passenger vehicle, truck, bus, or trailer, the tire's load rating shall be reduced by dividing by 1.10 before calculating the sum (*i.e.*, the sum of the load ratings of the tires on each axle, when the tires' load carrying capacity at the recommended tire cold inflation pressure is reduced by dividing by 1.10, must be appropriate for the GAWR).

* * * * *

S5.3 Each vehicle shall show the information specified in S5.3.1 and S5.3.2 and, in the case of a vehicle equipped with a non-pneumatic spare tire, the information specified in S5.3.3, in the English language, lettered in block capitals and numerals not less than 2.4 millimeters high and in the format set forth following this paragraph. This information shall appear either—

(a) After each GAWR listed on the certification label required by § 567.4 or § 567.5 of this chapter; or at the option of the manufacturer,

(b) On the tire information label affixed to the vehicle in the manner, location, and form described in § 567.4 (b) through (f) of this chapter as appropriate of each GVWR–GAWR combination listed on the certification label.

* * * * *

■ 6. Section 571.139 is amended by revising S3 and S5, adding S5.1 through S5.4, adding the text of S6, and adding S6.1 through S6.6 to read as follows:

§ 571.139 Standard No. 139; New pneumatic radial tires for light vehicles.

* * * * *

S3. Definitions

Bead means the part of the tire that is made of steel wires, wrapped or reinforced by ply cords and that is shaped to fit the rim.

Bead separation means a breakdown of the bond between components in the bead.

Bias ply tire means 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.

Carcass means the tire structure, except tread and sidewall rubber which, when inflated, bears the load.

Chunking means the breaking away of pieces of the tread or sidewall.

Cord means the strands forming the plies in the tire.

Cord separation means the parting of cords from adjacent rubber compounds.

Cracking means any parting within the tread, sidewall, or inner liner of the tire extending to cord material.

CT means a pneumatic tire with an inverted flange tire and rim system in which the rim is designed with rim flanges pointed radially inward and the tire is designed to fit on the underside of the rim in a manner that encloses the rim flanges inside the air cavity of the tire.

Extra load tire means a tire designed to operate at higher loads and at higher inflation pressures than the corresponding standard tire.

Groove means the space between two adjacent tread ribs.

Innerliner means the layer(s) forming the inside surface of a tubeless tire that contains the inflating medium within the tire.

Innerliner separation means the parting of the innerliner from cord material in the carcass.

Light truck (LT) tire means a tire designated by its manufacturer as primarily intended for use on lightweight trucks or multipurpose passenger vehicles.

Load rating means the maximum load that a tire is rated to carry for a given inflation pressure.

Maximum load rating means the load rating for a tire at the maximum permissible inflation pressure for that tire.

Maximum permissible inflation pressure means the maximum cold inflation pressure to which a tire may be inflated.

Measuring rim means the rim on which a tire is fitted for physical dimension requirements.

Open splice means any parting at any junction of tread, sidewall, or innerliner that extends to cord material.

Outer diameter means the overall diameter of an inflated new tire.

Overall width means the linear distance between the exteriors of the sidewalls of an inflated tire, including elevations due to labeling, decorations, or protective bands or ribs.

Ply means a layer of rubber-coated parallel cords.

Ply separation means a parting of rubber compound between adjacent plies.

Pneumatic tire means a mechanical device made of rubber, chemicals, fabric and steel or other materials, that, when mounted on an automotive wheel, provides the traction and contains the gas or fluid that sustains the load.

Radial ply tire means a pneumatic tire in which the ply cords that extend to the beads are laid at substantially 90 degrees to the centerline of the tread.

Reinforced tire means a tire designed to operate at higher loads and at higher inflation pressures than the corresponding standard tire.

Rim means a metal support for a tire or a tire and tube assembly upon which the tire beads are seated.

Section width means the linear distance between the exteriors of the sidewalls of an inflated tire, excluding elevations due to labeling, decoration, or protective bands.

Sidewall means that portion of a tire between the tread and bead.

Sidewall separation means the parting of the rubber compound from the cord material in the sidewall.

Test rim means the rim on which a tire is fitted for testing, and may be any rim listed as appropriate for use with that tire.

Tread means that portion of a tire that comes into contact with the road.

Tread rib means a tread section running circumferentially around a tire.

Tread separation means pulling away of the tread from the tire carcass.

Treadwear indicators (TWI) means the projections within the principal grooves designed to give a visual indication of the degrees of wear of the tread.

Wheel-holding fixture means the fixture used to hold the wheel and tire assembly securely during testing.

* * * * *

S5. General requirements

S5.1. Size and construction. Each tire shall fit each rim specified for its size designation in accordance with S4.1.

S5.2. Performance requirements. Each tire shall conform to each of the following:

(a) It shall meet the requirements specified in S6 for its tire size designation, type, and maximum permissible inflation pressure.

(b) It shall meet each of the applicable requirements set forth in paragraphs (c) and (d) of this S5.2, when mounted on a model rim assembly corresponding to any rim designated by the tire manufacturer for use with the tire in accordance with S4.

(c) Except in the case of a CT tire, its maximum permissible inflation pressure shall be 240, 280, 300, 340, or 350 kPa. For a CT tire, the maximum permissible inflation pressure shall be 290, 330, 350, or 390 kPa.

(d) Its load rating shall be that specified either in a submission made by an individual manufacturer, pursuant to S4, or in one of the publications described in S4 for its size designation, type and each appropriate inflation pressure. If the maximum load rating for a particular tire size is shown in more than one of the publications described in S4, each tire of that size designation shall have a maximum load rating that is not less than the published maximum load rating, or if there are differing maximum load ratings for the same tire size designation, not less then the lowest published maximum load rating.

S5.3. Test sample. For the tests specified in S6, use:

(a) One tire for high speed;

(b) Another tire for endurance and low inflation pressure performance; and

(c) A third tire for physical dimensions, resistance to bead unseating, and strength, in sequence.

S5.4. Treadwear indicators. Except in the case of tires with a 12-inch or smaller rim diameter, each tire shall have not less than six treadwear indicators spaced approximately equally around the circumference of the tire that enable a person inspecting the tire to determine visually whether the tire has worn to a tread depth of one sixteenth of an inch. Tires with 12-inch or smaller rim diameter shall have not less than three such treadwear indicators.

* * * * *

S6. Test procedures, conditions and performance requirements. Each tire shall meet all of the applicable requirements of this section when tested according to the conditions and procedures set forth in S5 and S6.1 through S6.7.

S6.1. Tire dimensions

S6.1.1 Test conditions and procedures.

S6.1.1.1 Tire Preparation.

S6.1.1.1.1 Mount the tire on the measuring rim specified by the tire manufacturer or in one of the publications listed in S4.1.1

S6.1.1.1.2 In the case of a P-metric tire, inflate it to the pressure specified in the following table:

Inflation pressure (kPa)		T-type temporary use spare inflation pressure (kPa)	CT Tires (kPa)	
Standard	Reinforced		Standard	Reinforced
180	220	420	230	270

S6.1.1.1.3 In the case of a LT tire, inflate it to the pressure at maximum load as labeled on sidewall.

S6.1.1.1.4 Condition the assembly at an ambient room temperature of 38° C for not less than 24 hours.

S6.1.1.1.5 Readjust the tire pressure to that specified in S6.1.1.2.

S6.1.1.2 Test Procedure.

S6.1.1.2.1 Measure the section width and overall width by caliper at six points approximately equally spaced around the circumference of the tire, avoiding measurement of the additional thickness of the special protective ribs or bands. The average of the measurements so obtained are taken as the section width and overall width, respectively.

S6.1.1.2.2 Determine the outer diameter by measuring the maximum circumference of the tire and dividing the figure so obtained by Pi (3.14).

S6.1.2 Performance Requirements. The actual section width and overall width for each tire measured in accordance with S6.1.1.2, shall not exceed the section width specified in a submission made by an individual manufacturer, pursuant to S4.1.1(a) or in one of the publications described in S4.1.1(b) for its size designation and type by more than:

(a) (For tires with a maximum permissible inflation pressure of 32, 36, or 40 psi) 7 percent, or

(b) (For tires with a maximum permissible inflation pressure of 240, 280, 290, 300, 330, 350 or 390 kPa, or 60 psi) 7 percent or 10 mm (0.4 inches), whichever is larger.

S6.2 High Speed Performance

S6.2.1 Test conditions and procedures.

S6.2.1.1 Preparation of tire.

S6.2.1.1.1 Mount the tire on a test rim and inflate it to the pressure specified for the tire in the following table:

Tire application	Test pressure (kPa)
P-metric:	
Standard load	220
Extra load	260
Load Range C	320
Load Range D	410
Load Range E	500
CT:	
Standard load	270
Extra load	310

S6.2.1.1.2 Condition the assembly at 38° C for not less than three hours.

S6.2.1.1.3 Before or after mounting the assembly on a test axle, readjust the tire pressure to that specified in S6.2.1.1.1.

S6.2.1.2 Test procedure.

S6.2.1.2.1 Press the assembly against the outer face of a test drum with a diameter of 1.70 m ± 1%.

S6.2.1.2.2 Apply to the test axle a load equal to 85% of the tire's maximum load carrying capacity.

S6.2.1.2.3 Break-in the tire by running it for 2 hours at 80 km/h.

S6.2.1.2.4 Allow tire to cool to 38° C and readjust inflation pressure to applicable pressure in 6.2.1.1.1 immediately before the test.

S6.2.1.2.5 Throughout the test, the inflation pressure is not corrected and the test load is maintained at the value applied in S6.2.1.2.2.

S6.2.1.2.6 During the test, the ambient temperature, measured at a distance of not less than 150 mm and not more than 1 m from the tire, shall be maintained at not less than 38° C.

S6.2.1.2.7 The test is conducted, continuously and uninterrupted, for ninety minutes through three thirty-minute consecutive test stages at the following speeds: 140, 150, and 160 km/h.

S6.2.1.2.8 Allow the tire to cool for one hour. Measure its inflation pressure. Then, deflate the tire, remove it from the test rim, and inspect it for the conditions specified in S6.2.2(a).

S6.2.2 Performance requirements. When the tire is tested in accordance with S6.2.1:

(a) There shall be no visual evidence of tread, sidewall, ply, cord, innerliner, belt or bead separation, chunking, open splices, cracking, or broken cords.

(b) The tire pressure, when measured at least 1 hour after the end of the test, shall not be less than the initial pressure specified in S6.2.1.

S6.3 Tire Endurance

S6.3.1 Test conditions and procedures.

S6.3.1.1 Preparation of Tire.

S6.3.1.1.1 Mount the tire on a test rim and inflate it to the pressure specified for the tire in the following table:

Tire application	Test Pressure (kPa)
P-metric:	
Standard load	180
Extra load	220
LT:	
Load Range C	260
Load Range D	340
Load Range E	410
CT:	
Standard load	230
Extra load	270

S6.3.1.1.2 Condition the assembly at 38° C for not less than three hours.

S6.3.1.1.3 Readjust the pressure to the value specified in S6.3.1.1.1 immediately before testing.

S6.3.1.2 Test Procedure.

S6.3.1.2.1 Mount the assembly on a test axle and press it against the outer face of a smooth wheel having a diameter of 1.70 m ± 1%.

S6.3.1.2.2 During the test, the ambient temperature, measured at a distance of not less than 150 mm and not more than 1 m from the tire, shall not be less than 38° C.

S6.3.1.2.3 Conduct the test, without interruptions, at not less than 120 km/h test speed with loads and test periods not less than those shown in the following table:

Test period	Duration (hours)	Load as a percentage of tire maximum load rating
1	4	85%
2	6	90
3	24	100

S6.3.1.2.4 Throughout the test, the inflation pressure is not corrected and the test loads are maintained at the value corresponding to each test period, as shown in the table in S6.3.1.2.3.

S6.3.1.2.5 Allow the tire to cool for one hour after running the tire for the time specified in the table in S6.3.1.2.3, measure its inflation pressure. Inspect the tire externally on the test rim for the conditions specified in S6.3.2(a).

S6.3.2 Performance requirements. When the tire is tested in accordance with S6.3.1:

(a) There shall be no visual evidence of tread, sidewall, ply, cord, belt or bead separation, chunking, open splices, cracking or broken cords.

(b) The tire pressure, when measured at least one hour after the end of the test, shall not be less than the initial pressure specified in S6.3.1.

S6.4 Low Inflation Pressure Performance

S6.4.1 Test conditions and procedures.

S6.4.1.1 Preparation of tire.

S6.4.1.1.1 This test is conducted following completion of the tire endurance test using the same tire and rim assembly tested in accordance with S6.3 with the tire deflated to the following appropriate pressure:

Tire application	Test pressure (kPa)
P-metric:	
Standard load	140
Extra load	160
LT:	
Load Range C	200
Load Range D	260
Load Range E	320
CT:	
Standard load	170
Extra load	180

S6.4.1.1.2 The assembly is conditioned at not less than 38° C.

S6.4.1.1.3 Before or after mounting the assembly on a test axle, readjust the tire pressure to that specified in S6.4.1.1.1.

S6.4.1.2 Test procedure.

S6.4.1.2.1 The test is conducted for ninety minutes at the end of the test specified in S6.3, continuous and uninterrupted, at a speed of 120 km/h (75 mph).

S6.4.1.2.2 Press the assembly against the outer face of a test drum with a diameter of 1.70 m + 1%.

S6.4.1.2.3 Apply to the test axle a load equal to 100% of the tire's maximum load carrying capacity.

S6.4.1.2.4 Throughout the test, the inflation pressure is not corrected and the test load is maintained at the initial level.

S6.4.1.2.5 During the test, the ambient temperature, at a distance of not less than 150 mm and not more than 1 m from the tire, is maintained at not less than 38° C.

S6.4.1.2.6 Allow the tire to cool for one hour. Measure its inflation pressure. Then, deflate the tire, remove it from the test rim, and inspect it for the conditions specified in S6.4.2(a).

S6.4.2 Performance requirements. When the tire is tested in accordance with S6.4.1:

(a) There shall be no visual evidence of tread, sidewall, ply, cord, innerliner, belt or bead separation, chunking, open splices, cracking, or broken cords, and

(b) The tire pressure, when measured at least one hour after the end of the test, shall not be less than the initial pressure specified in S6.4.1.

S6.5 Tire strength.

S6.5.1 Tire strength for P-metric tires. Each tire shall comply with the requirements of S5.3 of § 571.109.

S6.5.2 Tire strength for LT tires. Each tire shall comply with the requirements of S7.3 of § 571.119.

S6.6 Tubeless tire bead unseating resistance. Each tire shall comply with the requirements of S5.2 of § 571.109.

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Otis Cox,

Deputy Administrator.

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