Criteria

1. Proximity of the line's theft rate, calculated in accordance with the statutory formula, to the median theft rate. Higher theft rate receives higher priority.

2. Approximate number of vehicles within such line scheduled to be produced in the upcoming model year. Larger total number receives higher priority. However, if the line is scheduled to be discontinued in the near future, it should be given lower priority than one which will continue to be produced.

3. Likelihood of significant changes in the design of the line (such as downsizing or restyling) that would reduce the number of interchangeable parts within such line as between the new model year and previous model years. Lines with significant style changes receive higher priority.

4. Whole vehicle recovery rate for such line in the most recent calendar year for which data are available. Lines with higher recovery rates receive lower priority.

5. Plans for installation of an anti-theft device for which the manufacturer intends to seek an exemption under Sec. 605 of Title VI. Lines likely to be exempted receive lower priority. (This criterion would not be applied until the agency has completed rulemaking regarding that exemption process.)

6. Number of lines, and actual number of vehicles produced, having interchangeable parts. Lines for which numerous low theft vehicles or lines have interchangeable parts receive lower priority.

Appendix C

Criteria for Selecting New Likely High Theft Lines.

Scope

These criteria specify the factors which the Administrator will take into account in determining whether a new line is likely to have a high theft rate and whether such line should therefore be covered by the theft prevention standard.

Purpose

The purpose of these criteria is to enable the Administrator to select, by agreement, if possible, with the manufacturer, those new lines which are likely to be high theft lines and therefore should be subject to the theft prevention standard.

Application

These criteria apply to lines of passenger motor vehicles initially introduced into commerce in the United States at any time after the beginning of the 2 calendar years immediately preceding the year in which the final theft prevention standard is promulgated; i.e., "new lines".

Methodology

These criteria will be applied to each "new line." The likely theft rate for such new line will be determined in relation to the national median theft rate, as detemined for the 2 calendar years immediately preceding the model year in which such new line will be introduced. If the new line is determined to be likely to have a theft rate above the national median, then the Administrator may select such line for coverage under the theft prevention standard.

Criteria

1. Retail price of the vehicle line.

2. Vehicle "image" or marketing strategy.

3. Vehicle lines against which the new line is intended to compete, and theft rate(s) of such line(s).

4. Vehicle line(s), if any, which the new line is intended to replace, and theft rate(s) of such line(s).

5. Presence or absence of any new theft prevention devices or systems.

6. For new lines already introduced into commerce on the date the final theft prevention standard is promulgated, preliminary theft rate(s), if known, based on data available.

PART 567—CERTIFICATION

Part 567 would be amended as follows:

2. The authority citation for Part 567 would be revised to read as follows:

Authority: 15 U.S.C. 1392, 1401, 1403, and 1407; 15 U.S.C. 1912 and 1915; 15 U.S.C. 2021, 2022, and 2023; delegation of authority at 49 CFR 1.50.

3. Section 567.1 would be revised to read as follows:

§ 567.1 Purpose.

The purpose of this part is to specify the content and location of, and other requirements for, the label or tag to be affixed to motor vehicles as required by section 114 of the National Traffic and Motor Vehicle Safety Act of 1966 (15 U.S.C. 1403) (the Safety Act) and by sections 105(c)(1) and 606(c) of the Motor Vehicle Information and Cost Savings Act (15 U.S.C. 1915(c) and 2026(c)) (the Cost Savings Act), and to provide the consumer with information to assist him in determining which of the Federal Motor Vehicle Safety Standards (Part 571 of this chapter) and Theft Prevention Standards (Part 541 of this chapter) (Standards) are applicable to the vehicle.

4. Section 567.2 would be revised to read as follows:

§ 567.2 Application.

(a) Except as povided for in subsection (c) of this section, this part applies to manufacturers and distributors of motor vehicles to which one or more standards are applicable.

(b) In the case of imported motor vehicles, the Safety Act requirement of affixing a label or tag applies to importers of vehicles admitted to the United States under 19 CFR 12.80(b)(1) to which the required label or tag is not affixed.

(c) In the case of imported motor vehicles, certification of compliance with the Motor Vehicle Theft Prevention Standard, as required by Section 606 of the Cost Savings Act, applies only to the manufacturer of the motor vehicle, as defined in § 541.4(b) of this chapter.

5. Section 567.4(g)(5) would be revised to read as follows:

§ 567.4 Requirements for manufacturers of motor vehicles.

* * * * *

(g) * * *

(5) The statement: "This vehicle conforms to all applicable Federal motor vehicle safety and bumper standards in effect on the date of manufacture shown above." The expression "U.S." or "U.S.A." may be inserted before the word "Federal."

(i) In the case of passenger cars manufactured on or after [insert the effective date of the theft prevention standard], and subject to the theft prevention standard of part 541, the expression ", bumper, and theft prevention" shall be substituted in the statement for the expression "and bumper".

* * * * *

(Sec. 101, Pub. L. 98-547, 98 Stat. 2754 (15 U.S.C. 2021); delegation of authority at 49 CFR 1.50)

Issued on May 3, 1985.

Diane K. Steed,

Administrator.

[FR Doc 85-11206 Filed 5-9-85; 8:45 am]

BILLING CODE 4910-59-M

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49 CFR Part 571

[Docket No. 85-06; Notice 1]

Federal Motor Vehicle Safety Standards; Hydraulic Brake Systems; Passenger Car Brake Systems

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

ACTION: Notice of proposed rulemaking.

SUMMARY: This notice proposes a new Standard No. 135, *Passenger Car Brake Systems*, which would replace Standard No. 105, *Hydraulic Brake Systems*, as it applies to that vehicle type. The new standard would differ from the existing one primarily in that it contains a revised and shortened test procedure based on a draft harmonized international procedure developed by the United Nations Economic Commission for Europe (ECE). NHTSA believes that the new standard would ensure the same level of safety for the aspects of performance covered by Standard No. 105, while improving safety by addressing some additional safety issues. The standard would make it easier for manufacturers to build the same braking systems for installation in cars to be sold in different parts of the world, thereby resulting in cost savings. Compliance costs would also be reduced by the shorter test procedure.

DATES: Comments must be received on or before October 7, 1985. The proposed changes in the Code of Federal Regulations would become effective 30 days after publication of a final rule in the **Federal Register**, at which time optional compliance with the new standard instead of Standard No. 105 would be permitted. The proposed effective date for mandatory compliance with the new standard is September 1, 1991.

ADDRESSES: Comments should refer to the docket and notice numbers and be submitted to: Docket Section, National Highway Traffic Safety Administration, 400 Seventh Street, SW., Washington, D.C. 20590. Docket hours are 8 a.m. to 4 p.m., Monday through Friday.

FOR FURTHER INFORMATION CONTACT: Mr. Duane Perrin, Office of Vehicle Safety Standards, National Highway Traffic Administration, 400 Seventh Street, SW., Washington, D.C. 20590 (202–426–2800).

SUPPLEMENTARY INFORMATION:

Background

Over the past several years, NHTSA has had a policy of reviewing its Federal motor vehicle safety standards to assess the current effectiveness of and necessity for each of those standards. Efforts to identify ineffective or unnecessarily burdensome provisions have taken several courses. The agency on its own has initiated a variety of rulemaking actions to modify or eliminate such provisions while preserving the safety goals of the affected standards. The agency has also worked with international standards bodies to revise some of its standards through the harmonization process.

This rulemaking action, which relates to the brake requirements for passenger cars, grew out of that process. As the automotive industry has become an increasingly worldwide industry, interest in international harmonized standards has increased. With harmonized standards, manufacturers can build the same product to sell in different parts of the world. Significant cost savings can be achieved in areas of vehicle design, production, inventory and certification. Harmonization takes on additional importance under the Trade Agreements Act of 1979. That Act provides that Federal agencies may not engage in standards-related activity which creates unnecessary obstacles to the foreign commerce of the United States. In developing standards, agencies are required to take into consideration international standards and, if appropriate, base the standards on international standards. However, agencies are not required to base standards on international standards if it would be inappropriate to do so for reasons of safety.

Over the past several years, the United Nations Economic Commission for Europe (ECE) has worked toward developing an international harmonized brake standard for passenger cars. As a member of ECE, the United States has participated in that work.

This notice proposes a new Standard No. 135, *Passenger Car Brake Systems* which would replace Standard No. 105, as it applies to that vehicle type. The new standard differs from the passenger car provisions of Standard No. 105, *Hydraulic Brake Systems*, primarily in that its test procedure would be shorter. Standard No. 105 incorporates a very lengthy and complex test procedure, much of which consists of various conditioning procedures. The new test procedure is based on a simplified one developed during the ECE harmonization process.

The agency believes that the proposed standard would ensure the same level of safety for the aspects of performance covered by Standard No. 105, while improving safety by addressing some additional aspects of performance. Like Standard No. 105, the proposed standard would specify requirements for service brake effectiveness, fade and recovery, partial system failure, parking brakes, and equipment integrity. For the first time, the agency would establish adhesion utilization requirements, for the purpose of ensuring stability during braking under all conditions of traction, including wet roads. Unlike Standard No. 105, the proposed standard would not include water recovery requirements. As discussed below, the agency tentatively concluded that water recovery requirements can be eliminated since they are not necessary for disc brakes and all passenger cars now sold in the United States have front disc brakes.

In developing this proposal, NHTSA carefully evaluated a proposed harmonized test procedure and tentative performance requirements developed by an ad hoc committee of the ECE, as well as Standard No. 105. Performance data for vehicles tested according to these two procedures, and various other available data were also evaluated. Evaluation of any braking standard must include consideration of two major components: the test procedure and actual performance requirements. The test procedure of a braking standard consists primarily of numerous stops under various test conditions. Single vehicles are required to be capable of going through the entire test procedure while meeting specified performance requirements, e.g., stopping distances.

To the extent that the ECE draft harmonized test procedure adequately addressed aspects of performance covered by Standard No. 105, the agency tentatively adopted the ECE draft procedure for the proposal. Where the ECE draft contained requirements addressing aspects of performance not covered by Standard No. 105, the agency evaluated the appropriateness of proposing such requirements. Finally, where the ECE draft did not cover aspects of performance subject to the requirements of Standard No. 105, the agency evaluated the appropriateness of retaining or deleting such requirements.

During this process, the agency recognized that major deviations from the ECE draft harmonized test procedure, other than at or near the end, could reduce the usefulness of test data accumulated from tests run according to that procedure, for purposes of harmonization. As a vehicle goes through the test procedure, there are cumulative effects on the vehicle's braking performance. If NHTSA were to adopt a standard with major changes in the early part of the harmonized test procedure, the rest of the test procedure might no longer be comparable in terms of stringency to the original ECE draft. To the extent that changes are made only at or near the end of the harmonized procedure, the earlier parts of the test procedure remain comparable.

In considering specific performance requirements, the agency largely focused on the current levels established by

Standard No. 105. Those performance requirements have now been in effect for a decade and have not caused manufacturers any significant difficulty. The requirements have been justified in the past, and NHTSA does not believe that they should be reduced in stringency. The bulk of the proposed standard's test procedure is consistent with the ECE draft. Adoption of the proposed standard would be a major step toward harmonization and would make it much easier for manufacturers to build vehicles for the world market.

While the agency has sought to propose requirements that are similar in stringency to those of Standard No. 105, it should be emphasized that the issue of what levels of performance for the proposed standard are equivalent to Stadard No. 105 is a difficult one. Test procedures can significantly affect the stringency of performance requirements, both by the sequence of testing, i.e., the cumulative effects noted above, and by the various test conditions. As discussed below, the test procedure for the proposed standard is significantly different than that of Standard No. 105, making comparisons fairly difficult. The agency has devoted considerable effort to the task of estimating equivalent levels of stringency, including conducting a test program. The proposed performance requirements have been compared to the requirements of Standard No. 105 using several different methods for determining equivalent stringency, each of which has several advantages and disadvantages. The different methods and their results are discussed in the agency's Regulatory Evaluation. The agency requests comments on them and on the issue of whether any other methods should be considered. Results of NHTSA's test program are available in Docket 79-18-GRRF.

The agency emphasizes that the proposed standard is in many respects an entirely new standard. While this preamble discusses the more significant differences between the proposed standard and Standard No. 105, commenters are encouraged to carefully compare the regulatory texts.

Effectiveness Requirements

A crucial test of a vehicle's brake system is its effectiveness in bringing the vehicle to a quick and controlled stop in an emergency situation. Like Standard No. 105, the proposed standard would test a vehicle's braking performance in both a pre-burnish or new condition and after burnish, i.e., in a broken-in condition. (As discussed below, however, manufacturers would have the option of omitting the burnish procedure and going directly from the pre-burnish tests to the tests ordinarily conducted after burnish.) The pre-burnish tests are conducted under fully loaded conditions. The after-burnish tests are referred to as cold effectiveness tests in the proposed standard and would be conducted under both fully loaded and lightly loaded conditions. Performance requirements are specified in terms of stopping distances.

The ECE draft international harmonized test procedure does not include a pre-burnish test. The agency tentatively concludes that such a test should be included in the new standard since braking performance can vary significantly between pre-burnished and post-burnished conditions, and vehicles may be driven for many miles in a pre-burnished state. In order to preserve harmonization of the test procedure, the proposed standard incorporates the pre-burnish effectiveness test into the ECE draft's burnish procedure.

As noted above, manufacturers would have the option of omitting the burnish procedure and going directly from the pre-burnish tests to the cold effectiveness tests. The agency tentatively concludes that this option would minimize compliance costs while ensuring that vehicles are adequately tested during the cold effectiveness tests. In many cases, vehicle performance improves with burnish. If a manufacturer chooses the option of foregoing burnish, it may thus be more difficult to meet the cold effectiveness test requirements. In this situation, there does not appear to be any reason to impose the burnish procedure on the manufacturer. It is also possible that a vehicle's braking performance may be degraded by burnish. However, the agency believes that other requirements included in the standard would prevent any significant degradation caused by burnish. The reasons discussed below concerning why the agency believes that several of the proposed standard's requirements would ensure that a vehicle's braking performance is not significantly degraded by heating during fade are also relevant to this issue.

The three proposed tests discussed above, i.e., pre-burnish; cold effectiveness—fully loaded; and cold effectiveness—lightly loaded, correspond generally to Standard No. 105's first, second and third effectiveness tests.[1]

Standard No. 105 also includes a fourth effectiveness test. This test is conducted near the end of the test sequences, after the fade and recovery tests. As discussed below, the fade and recovery tests simulate the conditions experienced during a mountain descent. A vehicle's brakes become very hot during such conditions, which may affect subsequent braking performance. The fourth effectiveness test ensures adequate braking effectiveness after experiencing high temperatures. The test also includes a high speed test to ensure adequate braking for vehicles which are capable of very high speeds.

While NHTSA believes that these aspects of performance are important, it has tentatively concluded that they can adequately be addressed by means other than a full fourth effectiveness test. As discussed below, the proposed standard's fade and recovery tests include a hot stop test and a recovery stop test. These tests would help ensure that a vehicle's braking performance is not significantly degraded by the simulated fade conditions. Moreover, a final effectiveness test, which consists of 4 stops from 100 km/h (62.1 mph) and is included at the end of the proposed standard, following spike stops, would protest against significant degradation due to the simulated fade conditions. The proposed standard also includes high speed effectiveness tests, conducted before the fade and recovery tests, under both fully loaded and lightly loaded conditions. The agency believes that all of these tests together would adequately ensure the aspects of performance addressed by Standard No. 105's fourth effectiveness test and that including an additional test in the proposed standard would merely lengthen the test procedure without offering any concomitant benefits.

30-mph Tests

The agency also notes that the proposed standard's effectiveness tests do not include tests corresponding to Standard No. 105's 30-mph tests, which are part of that standard's first, second and fourth effectiveness tests. Tests at a speed of this magnitude were not included in the ECE draft harmonized test procedure because there was general agreement among the

[1] The proposed standard does not use the terminology of first, second, third and fourth effectiveness tests. As used in Standard No. 105, that terminology is based in part on the organization of the regulatory text. It should be noted in comparing the regulatory texts that they have different organizations. For example, the regulatory text of Standard No. 105 concerning effectiveness tests is organized in part by loading conditions, i.e., the second effectiveness test is at the fully loaded condition while the third effectiveness test is at the lightly loaded condition, whereas comparable tests in the proposed standard are organized together as part of the cold effectiveness test.

international delegates that such tests offer little information not provided by the higher speed tests. The agency tentatively agrees with this view. Assuming that a vehicle is capable of meeting the proposed standard's higher speed tests, the agency believes that it is highly unlikely that the vehicle would have difficulty meeting a 30-mph test of similar stringency.

Adhesion Utilization

The purpose of adhesion utilization requirements is to ensure that a vehicle's brake system is able to utilize whatever adhesion is available at the tire-road interface in such a way that a stable stop can be made within a specified distance. Adhesion utilization is addressed to some extent by Standard No. 105's (and the proposed standard's) service brake effectiveness requirements, since stops must be made within specified distances without leaving a lane of a specified width. All of those stops are made on a high friction surface, however. Standard No. 105 does not include any requirements concerning stops made on lower friction surfaces, such as wet roads.

The proposed adhesion utilization requirements are similar to those in the ECE's current braking standard, Regulation 13, and the corresponding directive of the European Economic Community (EEC). The requirements are expressed in terms of plots on a graph of the amount of adhesion utilized at each axle of the vehicle to produce a given level of deceleration. Using a specified test procedure, the adhesion utilized is graphically compared to the level of adhesion available at the tire/road interface. Four adhesion curves are plotted, representing the front and rear axle brake performance at each of two load conditions.

Two basic performance requirements would be established. First, none of the curves could cross an upper line for coefficients of friction between 0.2 (a low friction surface) and 0.8 (a high friction surface). The purpose of this requirement would be to ensure that, on all road surfaces from very slippery to dry, one axle is not overbraked with respect to the other. Put another way, this requirement would limit the amount that the performance of an individual axle could deviate from theoretically ideal brake balance. The effect of the overbraking of one axle with respect to the other would be to reduce the overall braking efficiency of the vehicle and make wheel lock-up at the axle more likely.

The second requirement would be that for all deceleration rates between 0.15 g (a mild stop) and 0.8 g (a severe stop), the curve for the front axle must be above that for the real axle. The purpose of this requirement would be to ensure stability of the vehicle by requiring the front axle to have a greater adhesion utilization than the rear axle. In practical terms, this means that if a driver applied the brakes hard enough to get wheel lockup, the front brakes would be the first to lock. Since locked wheels always tend to lead, the vehicle would skid but would remain stable, i.e., heading forward. However, if the rear wheels were to lock first, there would be a spin-out since those wheels would tend to lead.

The proposed adhesion utilization requirements differ from those of Regulation 13 in three ways. First, the proposal does not follow Regulation 13 in including an exception to the requirement that, for all deceleration rates between 0.15 and 0.8 g, the curve for the front axle must be above that for the rear axle. Between 0.3 and 0.45 g, Regulation 13 permits the curves to invert, as long as they remain close to theoretically ideal adhesion. NHTSA does not believe that there is any reason to adopt the exception. Wheel lockup can easily occur on slippery wet roads in the range of decelerations between 0.3 and 0.45 g, which could result in spin-outs.

Second, the proposed adhesion utilization requirements take into account the engine retardation effects of a vehicle being braked in gear, whereas Regulation 13 does not. NHTSA believes this approach is more realistic, since it is not typical for a driver to place the car in neutral or deculutch at the beginning of a stop. The effect of considering engine retardation is to move the adhesion utilization curves for the driven axle to the right.

Third, while the proposed standard specifies a test method for determining adhesion utilization, Regulation 13 does not. In Europe, compliance with safety standards is based on type approval. Manufacturers submit various information to governmental authorities which approve or disapprove a vehicle based on the information and on vehicle testing. In the United States, the government does not engage in approving or disapproving vehicles with respect to their safety performance. Under the National Traffic and Motor Vehicle Safety Act, manufacturers must certify that their vehicles comply with applicable safety standards. Safety standards are required to be objective to enable manufacturers to ensure that their vehicles are in compliance. To provide such objectivity, the agency must specify a specific method for determining adhesion utilization.

The proposed method involves a road test to determine actual braking force as a function of brake line pressure for each axle separately. From this information, plus brake valve characteristics, coast-down effects, engine braking effects, and center of gravity, the curves of adhesion utilized versus deceleration can be plotted. While the final curves are based on calculations, the input variables are all actual test measurements made under specified conditions. The proposed method takes account of rolling friction, aerodynamic drag and engine braking, which are present in actual braking situations but are not considered in theoretical design calculations, which are generally used for type approval.

The curves would be generated for a speed of 50 km/h (31.1 mph), which represents a value in the middle of the range of speeds that a vehicle ordinarily experiences during braking. Although higher initial speeds are used for stopping distance testing, the agency believes that 50 km/h is an appropriate speed for adhesion utilization testing because a vehicle shows more sensitivity to wheel lockup at slower speeds than at higher speeds and because a slower speed makes the test easier and safer to run. Curves would be calculated for vehicle performance in gear in order to account for engine braking effects normally present in actual driving situations. The adhesion utilization test procedure is discussed at length in a paper published by the Society of Automotive Engineers (SAE), Radlinski, R.W., and Flick, M.A., "A Vehicle Test Procedure for Determining Adhesion Utilization Properties," #840334, February 1984. The proposed procedue has been revised slightly from that in the SAE paper, to decrease its sensitivity to testing variability. The agency specifically requests comments on the proposed test procedure and on any others that should be considered.

The agency notes that there are limitations to any possible single adhesion utilization test, since brake balance, like most other aspects of braking performance, can change in use and over time. It is not feasible at this time to establish specific performance requirements which test a vehicle's adhesion utilization under all of the many varied conditions a vehicle is likely to experience during its lifetime. The proposed requirements would ensure reasonable adhesion utilization for new vehicles, a significant step toward ensuring safer vehicles. A vehicle meeting such requirements could become unsafe over time if the brake balance significantly changed. However,

by using sound engineering judgment, manufacturers could design vehicles in such a manner that good brake balance will be maintained over a vehicle's lifetime.

The agency also emphasizes that it is not proposing to decrease the level of stringency of any of Standard No. 105's other requirements in light of the proposed adhesion utilization requirements. In particular, available data clearly show that Standard No. 105's stopping distance requirements can easily be met by vehicles which have good adhesion utilization.

The proposed adhesion utilization requirements would apply only in part to vehicles equipped with fully operational anti-lock systems. The stability aspect of adhesion utilization would automatically be satisfied as long as the anti-lock system prevented wheel lockup as intended. Anti-lock-equipped vehicles would still have to meet the braking efficiency aspect of the adhesion utilization requirement, however. Regulation 13 includes special requirements to test anti-lock-equipped vehicles which have not been adopted in this proposal. In testing two vehicles with anti-lock systems to these ECE requirements, NHTSA encountered problems with the test procedure. One vehicle showed braking efficiencies of well over 100%, which is theoretically impossible. The ECE is currently considering possible changes to the anti-lock requirements. At present, NHTSA does not believe that it should propose any similar requirements.

The agency notes that five out of 19 cars tested failed the proposed adhesion utilization requirements. The agency believes that the vast majority of cars can meet the proposed requirements with either no changes or relatively minor changes. It is possible that manufacturers may choose to meet the requirements for some cars by using variable proportioning valves. The agency particularly requests comments on the types of changes that may be necessary to meet the proposed requirements and the number of vehicles that would be affected.

Fade and Recovery

The purpose of the fade and recovery tests is to ensure adequate braking capability during and after exposure to the high brake temperatures caused by prolonged or severe use. Such temperatures are typically experienced in long, downhill driving. The proposed requirements consist of a heating sequence, a hot stop test, a cooling sequence and a recovery stop test.

The agency is not proposing to adopt the ECE draft test procedure's heating sequence. In vehicle tests, that heating sequence produced brake temperatures more than 100 °F. lower than Standard No. 105's second fade test procedure. The temperatures produced by Standard No. 105's procedure had previously been verified as being representative of the temperatures experienced by vehicles travelling in mountainous areas. The agency is particularly concerned about this difference because the relationship between temperature and fade is not a linear one. For one brake lining, there is a "knee" in the curve, above which degradation due to fade is much more pronounced. If that "knee" occurred at a temperature between those produced by the ECE draft test procedure and Standard No. 105 procedure, a vehicle's braking system could meet the ECE draft requirements but still experience a sharply increased propensity to fade during mountain descents.

The agency has developed a new heating sequence for this proposal, based on SAE Recommended Practice J1247 (Apr 80), Simulated Mountain Brake Performance Test Procedure. This sequence produces temperatures similar to those of the Standard No. 105 procedure. The agency believes that it produces a temperature cycle that more closely approximates an actual mountain descent than either Standard No. 105 or the ECE draft test procedure.

As an alternative, the agency is considering modifying the ECE draft test procedure by shortening the time interval between snubs from 45 seconds to 30 seconds. This would result in temperatures that compare with those obtained in Standard No. 105. One problem, however, is that some cars are not powerful enough to accelerate to the 120 km/h test speed in the time interval permitted. The primary advantage of this alternative is that it would be closer to the heating sequence of the ECE draft test procedure.

The agency requests comments on both alternatives and, with respect to the second alternative, comments on how vehicles that cannot accelerate to 120 km/h in the specified time interval should be tested. Since NHTSA believes that the first alternative more closely approximates an actual mountain descent, the agency would particularly appreciate more detailed comments from any commenters which support the second alternative. The agency contemplates adopting one or the other alternative and not providing an option in this area.

The proposed test procedure and the ECE draft procedure differ in the method used for determining the amount of force to be applied to the brakes during fade and other brake testing. The proposal uses the constant output method while the ECE draft harmonized test procedure uses the constant input method. In the constant output method, vehicle deceleration is held constant and pedal force is varied as necessary to keep deceleration at the prescribed level. In the constant input method, either pedal force or brake line pressure is held constant and the deceleration of the vehicle is allowed to vary.

Although the choice of method is not very important for most types of brake testing, the agency believes that it is important for fade testing. Brake fade is caused by heat buildup in the brake components. This heat buildup is a function not only of the total amount of energy imparted to the brakes during the stops or snubs, but also the rate at which that energy is applied. For a given sequence of brake applications, the total energy input depends only on the number of applications, and the initial and final speed. That will be the same with either method. For the constant decleration method, the rate of application of that energy will also be fixed. For the constant pedal force method, however, the deceleration rate (and hence the time to input the energy) will vary with the performance of the brakes. If the brakes fade, the deceleration drops off. A drop in deceleration decreases the amount of work being done by the brakes, which decreases the amount of heat buildup (the factor that causes fade). Therefore, the test becomes easier for vehicles that perform poorly. This result leads the agency tentatively to disfavor the constant input method because NHTSA believes that a test that varies in severity according to the performance of the vehicle being tested is inappropriate for a Federal motor vehicle safety standard. Accordingly, the constant output method appears preferable.

Another reason in favor of a constant output method is that it produces less variability in testing. With the constant output method, the test driver attempts to maintain the prescribed deceleration throughout each test run, and any random errors will tend to cancel each other out. With the constant input method, however, the pedal force maintained is based on the average pedal force on two baseline snubs. Any errors made in determining the baseline pedal force will therefore also be introduced in each subsequent brake application, and the effect will be additive, rather than self-cancelling. With the constant output method, there is no need for the baseline snubs.

As noted above, the proposed fade and recovery test includes two

performance tests. The first, a hot stop test, specifies both a minimum stopping distance and a percentage limit on degradation from the performance achieved in the cold service brake test. This latter requirement would limit the amount of reduction in performance that a driver experiences when brakes are heated. The allowable pedal force could not exceed the mean pedal force actually used on the best cold stop.

The second, a recovery stop test, places both lower and upper limits on the difference in performance after recovery from that achieved in the cold service brake test. These limits are the same as included in the ECE draft. The upper limit is included to ensure that brakes do not become too sensitive when heated and "over-recover."

It is difficult to directly compare Standard No. 105's fade and recovery test with the proposed test, since the test procedures are entirely different. The proposed requirements are more simple than Standard No. 105's, since only one series of tests is run instead of two. Standard No. 105 does not include a hot stop performance test, although there is a limit on the pedal force applied during the heating stops. As noted above, both the proposal and Standard No. 105 include a recovery performance test. The agency believes that the proposed requirements would reduce the costs of testing while, particularly in light of the hot stop performance test, better ensuring safety.

Partial System Failure

Like Standard No. 105, the proposed standard would specify stopping distance requirements for conditions of circuit failure, power assist failure, and anti-lock or proportioning valve failure. If part of the service brake system should fail, it is crucial that the vehicle's brake system still be able to bring the vehicle to a controlled stop in a reasonable distance.

The agency notes that 11 out of 43 cars tested failed the proposed stopping distance requirement for power assist failure. As discussed by the Regulatory Evaluation, the primary factor which explains the failures is the lower maximum allowable control force of the proposed standard as compared to Standard No. 105 (500 N versus 667 N). This proposed test condition change, which is the same as the ECE draft, would increase the stringency of the requirement and necessitate redesigning of brake components on some cars to provide as greater mechanical or hydraulic gain. The test data indicate that while some redesign would be necessary, passenger cars can easily meet the proposed requirements. As discussed below, the agency believes the 500 N control force limit is justified based on human factors data. The proposed stopping distance, which is not significantly different from the specified in Standard No. 105, is derived from the proposed requirement for service brake stopping distance, using the same mathematical relationship used in the ECE draft. Since the agency is proposing a more stringent service brake stopping distance than that tentatively selected for the ECE draft, however, the proposed stopping distance for power assist failure is also more stringent. Given the number of failures in the test program, the agency particularly requests comments on the proposed requirements of power assist failure.

The proposed standard would also establish a new requirement for brake performance after engine failure. The requirement would ensure that a driver can make at least one stop with 90 percent of full service brake performance following engine failure. Since engine failure is a relatively common occurrence, the agency believes this is a reasonable requirement.

The vast majority of all cars already meet the proposed engine failure requirement, which requires the use of a supplemental source of stored energy for the booster, such as a vacuum reservoir or hydraulic accumulator. Of 44 cars tested, one failed the proposed requirement. That car was equipped with a hydraulic booster without an accumulator. The agency requests comments on the costs associated with meeting the requirements and the specific number of vehicles that would be affected.

Parking Brake

Like Standard No. 105, the proposed standard would require that the parking brake of passenger cars be able to hold the vehicle when it is parked on a specified gradient and a force not exceeding a specified amount is applied to the parking brake. There are several significant differences in test conditions, however.

Since the static parking brake test is a pass/fail type of test, i.e., the parking brake either holds the vehicle or it does not, the test conditions determine the stringency of the performance requirement. Two conditions are of primary importance, the gradient and allowable control force. The two are interrelated in that, for the same parking brake system, it is generally true that the higher the force that is applied to the control, the steeper the gradient on which the vehicle can be held in place.

The agency believes that the proposed parking brake requirement would have a level of stringency approximately the same as that of Standard No. 105. The standard would specify a less stringent gradient, 20 percent instead of 30 percent, in line with the ECE draft harmonized test procedure. To offset that change and thereby maintain the existing level of stringency, the agency is also proposing a more stringent, i.e., lower, allowable control forces, 500 N (113 pounds) for foot-operated parking braking systems instead of 125 pounds and 320 N (72 pounds) instead of 90 pounds for hand-operated parking brake systems.

The agency notes that of 18 passenger cars with foot-applied parking brakes that were tested to the proposed requirements, five failed. The agency believes that the vast majority of cars can meet the proposed requirements with either no changes or relatively minor changes, such as improving the mechancial advantage of some foot-applied parking brakes. The agency requests comments on the types of changes that may be necessary to meet the proposed requirements and the number of vehicles that would be affected.

While Standard No. 105 tests the parking brake with the vehicle in both a fully loaded condition and a lightly loaded condition, the proposed standard would only test the vehicle in the fully loaded condition. The purpose of testing in a lightly loaded condition is to ensure that the parking brakes do not simply lock a very lightly loaded axle and allow the vehicle to slide. Wheel slide is not likely to be a problem on a 20 percent gradient given the weight distribution of passenger cars. Gradients which are significantly greater than 20 percent are very rare in the United States, and the agency does not believe that this aspect of performance needs to be tested.

The agency notes that Standard No. 105 includes a barrier impact test of the strength of a transmission or driveline parking mechanism, as part of an option. For vehicles with a transmission or transmission control incorporating a parking mechanism that must be engaged before the ignition key can be removed (most automatic transmissions have this feature), manufacturers have the option of meeting the 30 percent gradient test with the transmission's parking mechanism engaged, so long as certain other requirements are also met. These include passing the same test on a 20 percent grade without the parking mechanism engaged and the moving barrier test. Since the proposed standard would specify a 20 percent grade instead

of a 30 percent grade, the agency does not believe this type of option should be provided. The agency requests comments on not providing the option.

The proposed standard would establish a new dynamic stopping test using the parking brake. NHTSA believes that the primary means for emergency stopping should be the service brakes. That aspect of performance is addressed by the partial failure requirements. Nevertheless, drivers could occasionally use the parking brake as an emergency brake. The proposed parking brake dynamic stopping test, which is identical to that in the harmonized test procedure, would improve safety by ensuring that drivers can also use the parking brake for that purpose.

The ECE draft harmonized test procedure also includes a parking brake test which NHTSA is not proposing, a test with a trailer. That test requires a passenger car's parking brake to be able to hold the vehicle and an attached trailer on a 12 percent grade. Based on engineering analysis, the agency has determined that the proposed parking brake test without a trailer ensures that a vehicle would be able to meet this requirement so long as trailer weight is not more than about 65 percent of passenger car weight. Accordingly, the agency does not believe there is a safety need to include the trailer test in the proposed standard for passenger cars.

Equipment Integrity

Like Standard No. 105, the proposed standard would test the capability of a vehicle's braking system to withstand a series of severe "spike" stops without loss of structural integrity. A final effectiveness test follows the spike stops to ensure that the vehicle still has adequate braking capability. While these tests are not included in the ECE draft harmonized test procedure, the agency believes that the tests address an important aspect of safety performance. Since a vehicle's brakes are occasionally subjected to sudden, very hard applications during normal usage, it is important that the brake system components be strong enough to avoid being bent or otherwise damaged by those applications. As noted above, the final effectiveness test following the spike stops would also help ensure that a vehicle's brakes are not significantly degraded by conditions of fade.

The spike stop test and final effectiveness test are relatively simple to conduct. Since they are conducted at the end of the test sequence, their inclusion would not affect the relative stringency of the preceding portion of the test procedure.

Since these tests are not included in the ECE draft harmonized test procedure, the agency specifically requests comments on the desirability of their inclusion in the proposed standard. Any commenters opposing adoption of the tests should provide detailed arguments in favor of their position, including comments addressing the above discussion.

Equipment Safety and Failure Warning Requirements

Standard No. 105 includes a number of equipment and failure warning requirements, most notably for reservoir capacity, failure warning indicators, and fluid reservoir labeling. Regulation 13 contains similar, but in some cases different, requirements. While these requirements have been discussed to some extent as part of the ECE harmonization process, they have not yet received the degree of attention that has been given to the road tests. Most of the proposed requirements are essentially the same as those in Standard No. 105.

One notable addition is a requirement that the fluid level in a master cylinder reservoir be able to be checked without removing the cap. The agency believes that this is in the interest of safety for two reasons. First, since it would be easier to check fluid level, drivers and maintenance personnel would be more likely to routinely make such checks. Second, it is desirable not to have to remove the cap since that creates a situation where the brake fluid can be contaminated. Under the proposal, the requirement could be met by a means to check fluid without removing the reservior cap, e.g., by constructing the reservior of a transparent material or by having a fluid level sensor. There is already a trend in passenger car design to use transparent material to enable checking of the brake fluid without removing the cap. If a passenger car had a fluid level seneor, i.e., activation of the brake warning light in situations of low fluid level, the requirement would be deemed met. With a fluid level sensor, drivers would automatically be warned about low fluid level. The agency notes, however, that drivers would have to remove the cap to determine the actual level of brake fluid. Also, drivers might want to remove the cap to check brake fluid level rather than rely on the sensor for that purpose. The agency requests comments on permitting use of a fluid level sensor to meet this requirement.

Water Recovery

Unlike Standard No. 105, the proposed standard would not include a water recovery test. The purpose of a water recovery test in Standard No. 105 is to ensure that a vehicle will have adequate braking capability after exposure to water, such as would occur in going through a flooded area. Standard No. 105's test assesses the effects of such exposure by providing for driving a vehicle through a water trough and then testing its braking capability.

Application of a water recovery test to cars sold in this country does not appear to be necessary to ensure safe braking, for several reasons. First, there is little evidence that the potential adverse safety effects of water on braking capability is a problem for today's passenger cars. This is due in large part to the fact that all passenger cars sold in the United States now have disc brakes on at least the front axle. In the past, passenger cars had drum brakes on both the front and rear axles. While brake drums can trap water, the design of disc brakes is such that they tend to expel water. Indeed, with Standard No. 105's current test procedure, disc brakes on vehicles driven through the water trough often become completely dry before the vehicle's braking capability can be tested.

Second, the agency does not believe that inclusion of a water recovery test is necessary to ensure that manufacturers continue to equip their cars with front disc brakes. In Europe, where there is no water recovery requirement, almost all passenger cars have front disc brakes.

Third, the agency believes that the brakes of modern cars are sufficiently shielded from direct water spray to make water fade unlikely. Moreover, the application of friction materials that are highly resistant to wet fade is fairly widespread on current passenger cars.

Test Conditions

Many of the proposed standard's test conditions are different from those of Standard No. 105. Some of those differences are discussed above. Other significant difference include the following:

A. Burnish. The proposed standard's burnish procedure, which is based on the ECE draft harmonized test procedure, is significantly shorter than that of Standard No. 105. The nature of many brake linings is such that a break-in period is needed for the braking system to achieve its full capability. Inclusion of a lengthy burnish procedure, however, significantly increases the cost of testing. The agency believes that brakes can adequately be burnished using a shorter procedure than that specified by Standard No. 105, thereby decreasing testing costs. As

discussed above, manufacturers would be permitted the option of foregoing burnish entirely as a way of making even greater cost savings.

B. Number of runs per test condition. Standard No. 105 generally specifies that six stops be made for each test condition. Prescribed performance must be achieved on at least one stop. The purpose of specifying multiple stops is to enable test drivers to achieve a vehicle's best performance. The proposed standard would specify four stops, thereby reducing testing costs. Testing experience indicates that it takes only three or four stops for a test driver to attain the best possible performance.

C. Wheel lockup. Standard No. 105 generally permits lockup of one wheel during stopping distance tests. The proposed standard, in line with the ECE draft harmonized test procedure, would prohibit all lockup (except during spike stops). A vehicle's stopping performance is usually at its best with a brake application just short of that which would cause wheel lockup to occur. A test driver attempting to obtain a vehicle's best performance may thus inadvertently lock one or more wheels. With four stops permitted, however, the agency believes test drivers can determine a vehicle's best performance on at least one stop while avoiding all lockup.

For anti-lock-equipped vehicles, Standard No. 105 permits controlled lockup during the stopping distance tests. The proposed standard, in line with the ECE draft harmonized test procedure, would prohibit all lockup. The agency believes this is appropriate, since a well-designed, anti-lock system would pervent all lockup during the specified tests.

D. Control forces. The proposed standard specifies a more stringent control force limit for the service brake test than Standard No. 105, in line with the harmonized test procedure. The agency believes that these more stringent control forces are justified based on human factors data. In a study by Ford Motor Company,[2] female test subjects, chosen to be a representative sample of the female population, were confronted with an actual emergency braking situation in which maximum braking force applied over a ½ second interval was measured. The results indicate that only 56 percent of the female driving population can be expected (with 95 percent confidence) to be able to generate the 150 pound pedal force (667 N) specified by Standard No. 105 during an actual panic stop. By decreasing the control force limit to 500 N, at least 86 percent of the female driving population can be expected (with 95 percent confidence) to be able to generate the specified force during an emergency brake application. Other human factor studies have reached similar but not identical conclusions.[3] The agency has greater confidence in the results of the Ford study, however, since the others were conducted under laboratory conditions rather than actual driving situations.

As noted above, these lower control forces may necessitate redesigning of brake components on some cars to provide a greater mechanical or hydraulic gain, particularly to meet the requirements for performance with a failed power assist unit.

E. Road Surface. Like Standard No. 105, the proposed standard would specify road surface friction in terms of skid number. This test condition has proven to be satisfactory over many years.

The agency recognizes, however, that skid number is not generally used for this purpose in Europe. During the ECE harmonization meetings, there was some discussion about specifying road surface friction in terms of peak coefficient of friction. However, no procedure was developed for that purpose.

Road surface friction is an important test condition which the agency believes should ideally be the same in harmonized brake standards. For this reason, the agency requests comments on whether it should consider a method other than skid number for the proposed standard. Depending on the comments, the agency could issue a supplemental NPRM proposing an alternative method or initiate separate rulemaking or research to develop such a method for the future.

The agency notes that the International Standards Organization (ISO) has developed two draft test procedures which are relevant to this issue. One procedure, ISO/DTR 8350, Road Vehicles—High Friction Test Track Surface—Specifications, provides specifications for constructing a road test surface. The other procedure, ISO/DTR 8349, Road Vehicles—Measurement of Road Surface Friction, provides a method for measuring road surface friction. The agency requests comments on whether it should consider using these ISO documents in developing a specification of road surface in terms of peak coefficient of friction. If the agency were to propose specifying test surface in terms of peak coefficient of friction, it would contemplate proposing a specific number. If any commenters favor using the ISO documents for this purpose, the agency would appreciate analysis concerning the specific peak coefficient of the ISO test surface, whether test tracks constructed to the ISO specifications may have varying peak coefficients of friction either on a particular track or between tracks, how the peak coefficient of friction changes over time and as the track is used for testing, and how the test surface compares with that specified by Standard No. 105.

The agency also requests comments on any other documents or research that should be considered for specifying road surface friction in terms of peak coefficient of friction, and on any methods other than skid number or peak coefficient of friction that should be considered for specifying road surface.

F. Brake Adjustment. Standard No. 105 permits automatic brake adjusters to be locked out during testing. The proposed standard, in line with the ECE draft harmonized test procedure, would require automatic brake adjusters to be operational. The agency believes this is reasonable. Since automatic adjusters are operational in vehicle use, it is reasonable to require that they be operational during testing.

Analyses; Costs and Benefits

The agency has analyzed this proposal and determined that it is neither "major" within the meaning of Executive Order 12291 nor "significant" within the meaning of the Department of Transportation regulatory policies and procedures. The agency's detailed analysis of the economic effects is set forth in a preliminary regulatory evalution, copies of which are available from the Docket Section.

The preliminary regulatory evaluation concludes that the current Standard No. 105 has been successful in substantially upgrading brake performance and that the proposed requirements would improve safety by ensuring an equivalent level of safety for those aspects of performance covered by Standard No. 105 and by addressing several additional areas of brake performance which are safety

[2] Eaton, Dennis A. and Dittmeier, Henry J., "Braking and Steering Effort Capabilities of Drivers," Ford Motor Company, Automotive Research Office, Dearborn, Michigan, 1970 (published as SAE paper #700363, 1970 International Safety Conference Compendium (P-30), New York, NY, 1970, pp. 153-158).

[3] Stoudt, H. W., et al., "Vehicle Handling: Force Capabilities for Braking and Steering," Harvard School of Public Health, May 1969 (DOT Contract FH-11-6810); Mortimer, R.G. et. al, "Brake Force Requirement Study: Driver-Vehicle Braking Performance as a Function of Brake System Design Variables," Highway Safety Research Institute, April 1970 (DOT Contract FH-11-6952).

significant. Moreover, compliance testing costs would be reduced by the shortened test procedure, and the proposed five-year leadtime would enable manufacturers to make any necessary changes to meet the proposed requirements as part of their regular design cycle, with little or no impact on cost.

In accordance with the Regulatory Flexibility Act, the NHTSA has evaluated the effects of this action on small entities. Based upon this evaluation, I certify that the proposed amendments would not have a significant economic impact on a substantial number of small entities. As discussed by the agency's preliminary regulatory evaluation, only relatively simple changes would generally be needed for all passenger cars to meet this proposed standard. These changes would not significantly affect the purchase price of a vehicle. No changes would be needed for many cars. While some reduction in compliance costs would occur, the reduction would not be of a magnitude which would significantly affect the purchase price of a vehicle. For these reasons, neither manufacturers of passenger cars, nor small businesses, small organizations, and small governmental units which purchase motor vehicles, would be significantly affected by the proposed standard. Accordingly, no regulatory flexibility analysis has been prepared.

Finally, the agency has considered the environmental implications of this proposed rule in accordance with the National Environmental Policy Act of 1969 and determined that the proposed rule would not significantly affect the human environment.

The brake fluid reservoir labeling requirements in this proposal are considered to be information collection requirements, as that term is defined by the Office of Management and Budget (OMB) in 5 CFR Part 1320. Accordingly, these proposed requirements are being submitted to the OMB for its approval, pursuant to the requirements of the Paperwork Reduction Act (44 U.S.C. 3501 *et seq.*). Comments on the proposed information collection requirements should be submitted to: Office of Management and Budget, Office of Information and Regulatory Affairs, Washington, D.C. 20503, Attention: Desk Officer for NHTSA. It is requested that comments sent to the OMB also be sent to the NHTSA rulemaking docket for this proposed action.

Leadtime

While only relatively simple changes would be needed for virtually all passenger cars to meet the proposed standard, with no changes needed for many cars, any brake system redesign involves a certain amount of leadtime. The proposed standard's test procedure is sufficiently different from that of Standard No. 105 that implementation of the standard could require substantial testing by manufacturers before they could be sure what components would require redesign. In order to keep the costs of implementation low, a long leadtime is being proposed. Thus, manufacturers could incorporate any necessary changes into their normal design cycles, minimizing cost impacts.

Accordingly, the agency is proposing a mandatory effective date of September 1, 1991. It is contemplated that this would provide a leadtime of approximately five years after issuance of a final rule. The agency proposes an optional effective date for certifying passenger cars to the new standard instead of Standard No. 105 beginning 30 days after publication of a final rule in the **Federal Register**. The agency finds good cause for a short leadtime on an optional basis since the new standard would result in safety benefits over those of Standard No. 105, and, since compliance would be optional, there would be no imposition of mandatory new requirements during that time period.

Interested persons are invited to submit comments on the proposal. It is requested but not required that 10 copies be submitted.

All comments must be limited not to exceed 15 pages in length. (49 CFR 553.21) Necessary attachments may be appended to these submissions without regard to the 15-page limit. This limitation is intended to encourage commenters to detail their primary arguments in a concise fashion.

If a commenter wishes to submit certain information under a claim of confidentiality, three copies of the complete submission, including purportedly confidential information, should be submitted to the Chief Counsel, NHTSA, at the street address given above, and seven copies from which the purportedly confidential information has been deleted should be submitted to the Docket Section. A request for confidentiality should be accompanied by a cover letter setting forth the information specified in the agency's confidential business information regulation (49 CFR Part 512).

All comments received before the close of business on the comment closing date indicated above will be considered, and will be available for examination in the docket at the above address both before and after that date. To the extent possible, comments filed after the closing date will also be considered. However, the rulemaking action may proceed at any time after that date, and comments received after the closing date and too late for consideration in regard to the action will be treated as suggestions for future rulemaking. The NHTSA will continue to file relevant material as it becomes available to the docket after the closing date, and it is recommended that interested persons continue to examine the docket for new material.

Those persons desiring to be notified upon receipt of their comments in the rules docket should enclose, in the envelope with their comments, a self-addressed stamped postcard. Upon receiving the comments, the docket supervisor will return the postcard by mail.

List of Subjects in 49 CFR Part 571

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

PART 571—[AMENDED]

In consideration of the foregoing, 49 CFR Part 571 would be amended as follows:

1. The authority citation for Part 571 would be revised to read as follows:

Authority: 15 U.S.C. 1392, 1401, 1403, 1407; delegation of authority at 49 CFR 1.50.

§ 571.105 [Amended]

1. Section 571.105 would be amended by revising S3 to read as follows:

* * * * *

S3. *Application.* This standard applies to multipurpose passenger vehicles, trucks, and buses with hydraulic brake systems, and to passenger cars manufactured before September 1, 1991, with hydraulic brake systems. At the option of the manufacturer, passenger cars manufactured before September 1, 1991, may comply with the requirements of Federal Motor Vehicle Safety Standard No. 135, *Passenger Car Brake Systems*, instead of the requirements of this standard.

* * * * *

1. Section 571.135—Federal Motor Vehicle Safety Standard No. 135 would be added to read as follows:

§ 571.135 Federal Motor Vehicle Safety Standard No. 135.

Passenger Car Brake Systems

S1. *Scope.* This standard specifies requirements for service brake and associated parking brake systems.

S2. *Purpose.* The purpose of this standard is to ensure safe braking

performance under normal and emergency driving conditions.

S3. *Application.* This standard applies to passenger cars manufactured on or after September 1, 1991. In addition, passenger cars manufactured before September 1, 1991, may, at the option of the manufacturer, meet the requirements of this standard instead of Federal Motor Vehicle Safety Standard No. 105, *Hydraulic Brake Systems.*

S4. *Definitions.*

"Adhesion utilization curves" of a vehicle means curves showing, for specified load conditions, the adhesion utilized by each axle plotted against the braking ratio of the vehicle.

"Anti-lock system" means a portion of a vehicle's service brake system that automatically controls the degree of rotational wheel slip of one or more road wheels of the vehicle during braking.

"Backup system" means a portion of a service brake system, such as a pump, that automatically supplies energy in the event of a primary brake power source failure.

"Brake power assist unit" means a device installed in a hydraulic brake system that reduces the amount of muscular force that a driver must apply to actuate the system, and that, if inoperative, does not prevent the driver from braking the vehicle by a continued application of muscular force on the service brake control.

"Brake power unit" means a device installed in a brake system that provides the energy required to actuate the brakes, either directly or indirectly through an auxiliary device, with driver action consisting only of modulating the energy application level.

"Braking ratio" means the deceleration of the vehicle divided by the gravitational acceleration constant.

"Hydraulic brake system" means a system that uses hydraulic fluid as a medium for transmitting force from a service brake control to the service brake, and that may incorprate a brake power assist unit, or a brake power unit.

"Initial brake temperature" means the average temperature of the service brakes on the hottest axle of the vehicle 0.32 km (0.2 miles) before any brake application.

"Lightly loaded vehicle weight" or "LLVW" means unloaded vehicle weight plus 180 kg (396 pounds), including driver and instrumentation.

"Maximum speed" of a vehicle means the highest speed attainable by accelerating at a maximum rate from a standing start for a distance of 3.2 km (2 miles) on a level surfaces, with the vehicle at its lightly loaded vehicle weight.

"Parking mechanism" means a component or subsystem of the drive train that locks the drive train when the transmission control is placed in a parking or other gear position and the ignition key is removed.

"Pressure component" means a brake system component that contains the brake system fluid and controls or senses the fluid pressure.

"Skid number" means the frictional resistence of a pavement measured in accordance with American Society for Testing and Material (ASTM) Method E-274-70 (as revised July, 1974) at 40 mph, omitting water delivery as specified in paragraphs 7.1 and 7.2 of that method.

"Snub" means the braking deceleration of a vehicle from a higher reference speed to a lower reference speed that is greater than zero.

"Spike stop" means a stop resulting from the application of 900 N (202.3 pounds) of force on the service brake control in 0.08 second.

"Split service brake system" means a brake system consisting of two or more subsystems actuated by a single control designed so that a leakage-type failure of the pressure component in a single subsystem (except structural failure of a housing that is common to two or more subsystems) does not impair the operation of any other subsystem.

"Stopping distance" means the distance traveled by a vehicle from the point of application of force to the brake control to the point at which the vehicle reaches a full stop.

"Variable proportioning brake system" means a system that automatically adjusts the braking force at the axles to compensate for vehicle static axle loading and/or dynamic weight transfer between axles during deceleration.

S5. *Requirements.* Each vehicle shall meet the requirements of this section, under the conditions prescribed in S6, when tested according to the procedures and in the sequence set forth in S7. If a vehicle is incapable of attaining the specified test speed, it is tested at the speed that is a multiple of 5 Km/h (3.1 mph) and is 4 to 8 km/h (2.5 to 5.0 mph) less than its maximum speed, and its performance shall be within a stopping distance given by the formula provided for the specific requirement.

S5.1. *Full service brake system performance.*

S5.1.1. *Stopping performance.* The service brakes shall stop each vehicle in four series of effectiveness tests within the distances and from the speeds specified in S5.1.1.1 through S5.1.1.4.

S5.1.1.1. *Preburnished effectiveness.* In the preburnished effectiveness test, the vehicle shall stop, with its transmission in neutral, from 100 km/h (62.1 mph) within a distance of 72 m (236 ft). If the vehicle is incapable of attaining 100 km/h, it shall stop within a distance given by $S=0.05V+0.006V^2$, where S is the maximum stopping distance in m, and V is the test speed in km/h.

S5.1.1.2. *Cold effectiveness.* In the cold effectiveness tests, the vehicle shall stop, with its transmission in neutral, from 100 km/h (62.1 mph) within a distance of 65 m (214 ft). If the vehicle is incapable of attaining 100 km/h, it shall stop within a distance given by $S=0.05V+0.006V^2$, where S is the maximum stopping distance in m, and V is the test speed in km/h.

S5.1.1.3. *High speed effectiveness.* In the high speed effectiveness test, the vehicle shall stop, with its transmission in gear, from a speed which is 80% of the maximum speed of the vehicle, within a distance given by $S=0.05V+0.006V^2$, where S is the maximum stopping distance in m, and V is the test speed in km/h.

S5.1.1.4. *Final effectiveness.* In the final effectiveness test, the vehicle shall stop, with its transmission in neutral, from 100 km/h (62.1 mph) within a distance of 72 m (236 ft). If the vehicle is incapable of attaining 100 km/h, it shall stop within a distance given by $S=0.05V+0.006V^2$, where S is the maximum stopping distance in m, and V is the test speed in km/h.

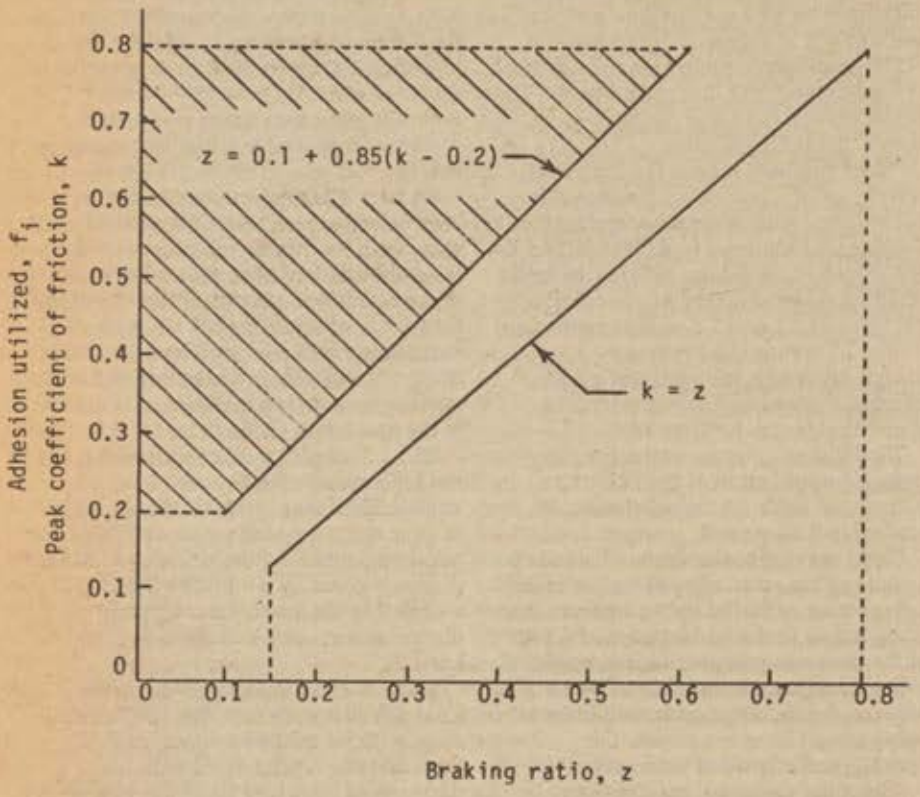
S5.1.2. *Adhesion Utilization.* Adhesion utilization curves for both front and rear axles of the vehicle are generated for a speed of 50 km/h (31.1 mph), in gear, for both GVWR and LLVW conditions. If the vehicle is not equipped with an anti-lock systems, the adhesion utilization curves shall meet the requirements of S5.1.2.1 and S5.1.2.2, as shown in Figure 1. If the vehicle is equipped with an anti-lock system, the curves are generated with the anti-lock system disabled, and only the requirement of S5.1.2.1 shall be met.

S5.1.2.1. *Braking efficiency of individual axles.* For all values of peak coefficient of friction, k, between 0.2 and 0.8, each adhesion utilization curve shall be situated to the right of a line defined by $z = 0.1 + 0.85 (k - 0.2)$, where z is the braking ratio.

S5.1.2.2. *Wheel lockup sequence.* For all braking ratios between 0.15 and 0.8, each adhesion utilization curve for a front axle shall be situated above the corresponding curve for the rear axle.

Figure 1

Adhesion Utilization Requirements



S5.1.3. *Fade and recovery.*

S5.1.3.1. *Hot performance.* After heating according to the procedure specified in S7.11.1, the vehicle shall stop, from 100 km/h (62.1 mph), with its transmission in neutral and with a pedal force equal to the average pedal force on the shortest cold effectiveness stop at GVWR, within a distance equal to the shorter of:

(a) 91 m (298 ft), or

(b) The shortest stopping distance achieved in the cold effectiveness test at GVWR divided by 60%.

If the vehicle is incapable of attaining 100 km/h, it is tested at the same speed used for the cold effectiveness test at GVWR, and the distance in (a) is given by $S=0.05V+0.0086V^2$, where S is the maximum stopping distance in m and V is the test speed in km/h.

S5.1.3.2. *Recovery performance.* After conducting the cooling stops according to procedure specified in S7.11.3, the vehicle shall stop from 100 km/h (62.1 mph), with its transmission in neutral and with a pedal force equal to the average pedal force on the shortest cold effectiveness stop at GVWR, in a distance that is:

(a) Not longer than the shortest stopping distance achieved in the cold effectiveness test at GVWR divided by 70%, and

(b) Not shorter than the shortest stopping distance achieved in the cold effectiveness test at GVWR divided by 120%.

If the vehicle is incapable of attaining 100 km/h, it is tested at the same speed used for the cold effectiveness test at GVWR.

S5.1.4. *Spike stops.* Each vehicle shall make 10 spike stops from 50 km/h (31.1 mph).

S5.2. *Partial service brake system performance.*

S5.2.1. *Hydraulic circuit failure.*

S5.2.1.1. For vehicles manufactured with a split service brake system, in the event of any rupture or leakage type of failure in a single subsystem, other than a structural failure of a housing that is common to two or more subsystems, the remaining portions of the service brake system shall continue to operate and shall stop the vehicle from 100 km/h (62.1 mph) within a distance of 155 m (509 ft). If the vehicle is incapable of attaining 100 km/h, it shall stop within a distance given by $s=0.05V+0.015V^2$, where S is the maximum stopping distance in m, and V is the test speed in km/h.

S5.2.1.2. For vehicles not manufactured with a split service brake system, in the event of any one rupture or leakage type of failure in any component of the service brake system and after activation of the brake system indicator as specified in S5.4.5.1, the vehicle shall, by operation of the service brake control, stop 10 times consecutively from 100 km/h (62.1 mph) within a distance of 155 m (509 ft.) If the vehicle is incapable of attaining 100 km/h, it shall stop within a distance given by $S=0.05V+0.015V^2$, where S is the maximum stopping distance in m, and V is the test speed in km/h.

S5.2.2. *Inoperative brake power assist unit or brake power unit.*

S5.2.2.1. *Engine failure (system charged).* The service brakes on a vehicle equipped with one or more brake power assist units or brake power units, with all such systems fully charged at the beginning of the stop but the vehicle's engine not running, shall stop the vehicle once from 100 km/h (62.1 mph) within a distance of 72m (236 ft). If the vehicle is incapable of attaining 100 km/h, it shall stop within a distance given by $S=0.05V+0.0067V^2$, where S is the maximum stopping distance in m and V is the test speed in km/h.

S5.2.2.2. *Unit failure (system depleted).* The service brakes on a vehicle equipped with one or more brake power assist units or brake power units, with one such unit inoperative and depleted of all reserve capability, shall stop the vehicle from 100 km/h (62.1 mph) within a distance of 155 m (509 ft). If the vehicle is incapable of attaining 100 km/h, it shall stop within a distance given by $S=0.05V+0.0015V^2$, where S is the maximum stopping distance in m, and V is the test speed in km/h.

S5.2.3. *Failed anti-lock or variable proportioning system.* The service brakes on a vehicle equipped with one or more anti-lock or variable proportioning systems, in the event of any single failure (structural or functional) in any one such system, shall stop the vehicle from 100 km/h (62.1 mph) within a distance of 80 m (263 ft). If the vehicle is incapable of attaining 100 km/h, it shall stop within a distance given by $S=0.005V+0.0075V^2$, where S

is the maximum stopping distance in m, and V is the test speed in km/h.

S5.3. *Parking brake system performance.* The requirements of S5.3.1 and S5.3.2 shall be met with a force applied to the parking brake control not exceeding 500 N (113 lb) for a foot-operated system or 320 N (72 lb) for a hand-operated system.

S5.3.1. *Gradient holding.* The parking brake system shall hold the vehicle stationary for 5 minutes in both a forward and reverse direction on a 20 percent grade, with the vehicle's transmission in neutral.

S5.3.2. *Dynamic performance.* The parking brake system shall stop the vehicle, with its transmission in neutral, from 60 km/h (37.3 mph) within a distance of 73 m (238 ft). In addition, the final deceleration rate just prior to stopping shall be at least 1.5m/sec^2 (4.92 ft/sec^2).

S5.4. *Equipment requirements.*

S5.4.1. *Service brake system.* Each vehicle shall be equipped with a service brake system acting on all wheels. Wear of the brakes shall be compensated for by means of a system of automatic adjustment.

S5.4.2. *Parking brake system.* Each vehicle shall be equipped with a parking brake system of a friction type with solely mechanical means to retain engagement.

S5.4.3. *Controls.* The service brakes shall be activated by means of a foot control. The control of the parking brake shall be independent of the service brake control, and may be either a hand or foot control. All service brake system requirements, including the partial system requirements of S5.2, shall be met solely by use of the service brake control.

S5.4.4. *Reservoirs.*

§ 5.4.4.1. *Master cylinder reservoirs.* A master cylinder shall have a reservoir compartment for each service brake subsystem serviced by the master cylinder. Loss of fluid from one compartment shall not result in a complete loss of brake fluid from another compartment.

§ 5.4.4.2. *Reservoir capacity.* Reservoirs, whether for master cylinders or other type systems, shall have a total minimum capacity equivalent to the fluid displacement resulting when all the wheel cylinders or caliper pistons serviced by the reservoirs move from a new lining, fully retracted position (as adjusted initially to the manufacturer's recommended setting) to a fully worn, fully applied position, as determined in accordance with § 7.15(c) of this standard. Reservoirs shall have completely separate compartments for each subsystem except that in reservoir systems utilizing a portion of the reservoir for a common supply to two or more subsystems, individual partial compartments shall each have a minimum volume of fluid equal to at least the volume displaced by the master cylinder piston servicing the subsystem, during a full stroke of the piston. Each brake power unit reservoir servicing only the brake system shall have a minimum capacity equivalent to the fluid displacement required to charge the system piston(s) or accumulator(s) to normal operating pressure plus the displacement resulting when all the wheel cylinders or caliper pistons serviced by the reservoir or accumulator(s) move from a new lining fully retracted position (as adjusted initially to the manufacturer's recommended setting) to a fully worn, fully applied position.

§ 5.4.4.3. *Reservoir labeling.* Each vehicle shall have a brake fluid warning statement that reads as follows, in letters at least 3.2 mm (1/8 inch) high: "WARNING, Clean filler cap before removing. Use only _____ fluid from a sealed container." (Inserting the recommended type of brake fluid as specified in 49 CFR 571.116, e.g., "DOT 3".) The lettering shall be:

(a) Permanently affixed, engraved or embossed;

(b) Located so as to be visible by direct view, either on or within 100 mm (3.94 inches) of the brake fluid reservoir filler plug or cap; and

(c) Of a color that contrasts with its background, if it is not engraved or embossed.

§ 5.4.4.4. *Fluid level indication.* Brake fluid reservoirs shall be so constructed that the level of fluid can be checked without need for the reservoir to be opened. This requirement is deemed to have been met if the vehicle is equipped with a brake fluid level indicator meeting the requirements of § 5.4.5.1(b).

§ 5.4.5. *Brake system warning indicator.* Each vehicle shall have one or more visual brake system warning indicators, mounted in front of and in clear view of the driver, which meet the requirements of § 5.4.5.1 through § 5.4.5.5. In addition, a vehicle manufactured without a split service brake system shall be equipped with an audible warning signal that activates under the conditions specified in § 5.4.5.1(a).

S5.4.5.1. *Activation.* An indicator shall be activated when the ignition (start) switch is in the "on" ("run") position and whenever any of conditions (a), (b) or (c) occur.

(a) A gross loss of fluid or fluid pressure (such as caused by rupture of a brake line but not by a structural failure of a housing that is common to two or more subsystems) as indicated by one of the following conditions (chosen at the option of the manufacturer):

(1) A drop in the level of the brake fluid in any master cylinder reservoir compartment to less than the recommended safe level specified by the manufacturer or to one-fourth of the fluid capacity of that reservoir compartment, whichever is greater.

(2) For vehicles equipped with a split service brake system, a differential pressure of 1.5 MPa (218 psi) between the intact and failed brake subsystems, measured at a master cylinder outlet or a slave cylinder outlet.

(3) A drop in the supply pressure in a brake power unit to a one-half of the normal system pressure.

(b) A total functional electrical failure in an anti-lock or variable proportioning brake system.

(c) Application of the parking brake.

S5.4.5.2. *Function check.* All indicators shall be activated as a check of function either when the ignition (start) switch is turned to the "on" ("run") position when the engine is not running, or when the ignition (start) switch is in a position between "on" ("run") and "start" that is designated by the manufacturer as a check position, and the transmission shift lever is in a position other than a forward or reverse drive position.

S5.4.5.3. *Duration.* Each indicator activated due to a condition specified in S5.4.5.1. shall remain activated as long as the condition exists, whenever the ignition (start) switch is in the "on" ("run") position, whether or not the engine is running.

S5.4.5.4. *Function.* When a visual warning indicator is activated, it may be continuous or flashing, except that the visual warning indicator on a vehicle not equipped with a split service brake system shall be flashing. The audible warning required for a vehicle manufactured without a split service brake system may be continuous or intermittent.

S5.4.5.5. *Labeling.* (a) Each visual indicator shall display a word or words, in accordance with the requirements of Standard No. 101 (49 CFR 571.101) and/or this section, which shall be legible to the driver under all daytime and nighttime conditions when activated. Unless otherwise specified, the words shall have letters not less than 3.2 mm (⅛ inch) high and the letters and background shall be of contrasting colors, one of which is red. Words or symbols in addition to those required by Standard No. 101 and/or this section may be provided for purposes of clarity.

(b) Vehicles manufactured with a split service brake system may use a single common brake warning indicator. If a single common indicator is used, it shall display the word "Brake"

(c) A vehicle manufactured without a split service brake system shall use a separate indicator to indicate the failure condition in S5.4.1(a). This indicator shall display the words "STOP—BRAKE FAILURE" in block capital letters not less than 6.4 mm (¼ inch) in height.

(d) If separate indicators are used for one or more than one of the functions described in S5.4.5.1(a) to S5.4.5.1(c), the indicators shall display the following wording:

(1) If a separate indicator is provided for the low brake fluid condition in S.5.4.5.1(a)(1), the words "Brake Fluid" shall be used except for vehicles using hydraulic system mineral oil.

(2) If a separate indicator is provided for the gross loss of pressure condition in S5.4.5.1(a)(2), the words "Brake Pressure" shall be used.

(3) If a separate indicator is provided for anti-lock failure as specified in S5.4.5.1(b), the single word "Antilock" or "Anti-Lock" may be used. The letters and background of a separate indicator for an antilock system shall be of contasting colors, one of which is yellow.

(4) If a separate indicator is provided for application of the parking brake as specified for S5.4.5.1(c), the single word "Park" may be used.

(5) If a separate indicator is provided for any other function, the display shall include the word "Brake" and appropriate additional labeling.

S5.5. *Brake system integrity.* Each vehicle shall meet the complete performance requirements of S5 without:

(a) Detachment or fracture of any component of the braking system, such as brake springs and brake shoe or disc pad facing, other than minor cracks that do not impair attachment of the friction facing. All mechanical components of the braking system shall be intact and functional. Friction facing tearout (complete detachment of lining) shall not exceed 10 percent of the lining on any single frictional element.

(b) Any visible brake fluid or lubricant on the friction surface of the brake, or leakage at the master cylinder or brake power unit reservior cover, seal, and filler openings.

S6. *Test Conditions.* The performance requirements of S5 shall be met under the following conditions. Where a range of conditions is specified, the vehicle shall meet the requirements of all points within the range.

S6.1. *Ambient conditions.*

S6.1.1. *Ambient temperature.* The ambient temperature is any temperature between 0 °C (32 °F) and (40 °F).

S6.1.2. *Wind speed.* The wind speed is not greater than 5m/sec (11.2 mph).

S6.2. *Road test surface.*

S6.2.1. *Skid number.* The road test surfact has a skid number of 81.

S6.2.2. *Gradient.* Except for the parking brake gradient holding test, the test surface has no more than a 1% gradient in the direction of testing and no more than a 2% gradient perpendicular to the direction of testing.

S6.2.3. *Lane width.* Road tests are conducted on a test lane 3.5m (11.5ft) wide.

S6.3. *Vehicle conditions.*

S6.3.1. *Vehicle weight.* Except for the test at LLVW in S7.7, S7.8 and S7.9, the vehicle is loaded to its GVWR such that the weight on each axle as measured at the tire-ground interface is in proportion to its GAWR, except that the fuel tank is filled to 100 percent of capacity at the beginning of testing (corresponding to full GVWR loading) and may not be less than 75 percent of capacity during any part of the testing. However, if the weight on any axle of a vehicle at lightly loaded vehicle weight exceeds the axle's proportional share of the gross vehicle weight rating, the load required to reach GVWR is placed so that the weight on that axle remains the same as at lightly loaded vehicle weight.

For the tests at LLVW specified in S7.7, S7.8 and S7.9, the vehicle is loaded to its lightly loaded vehicle weight, with the added weight distributed in the front passenger seat area.

S6.3.2. *Lining preparation.* At the beginning of preparation for the road test in S7.1, the brakes of the vehicle are in the same condition as when the vehicle is manufactured. No burnishing or other special preparation is allowed, unless all vehicles sold to the public are similarly prepared as a part of the manufacturing process

S6.3.3. *Adjustment and repairs.* the requirements must be met without replacing any brake system part or making any adjustments to the brake system except as specified in this standard. Where a brake adjustment is specified in this standard, adjust the brakes, including the parking brakes, in accordance with the manufacturer's recommendation. Automatic adjusters are operational throughout the entire test sequence and are adjusted manually or by making stops, as recommended by the manufacturer. The brakes are adjusted in this manner prior to the beginning of the road test sequence.

S6.3.4. *Tire iniflation pressure.* Tires are inflated to the pressure recommended by the vehicle manufacturer for the GVWR of the vehicle.

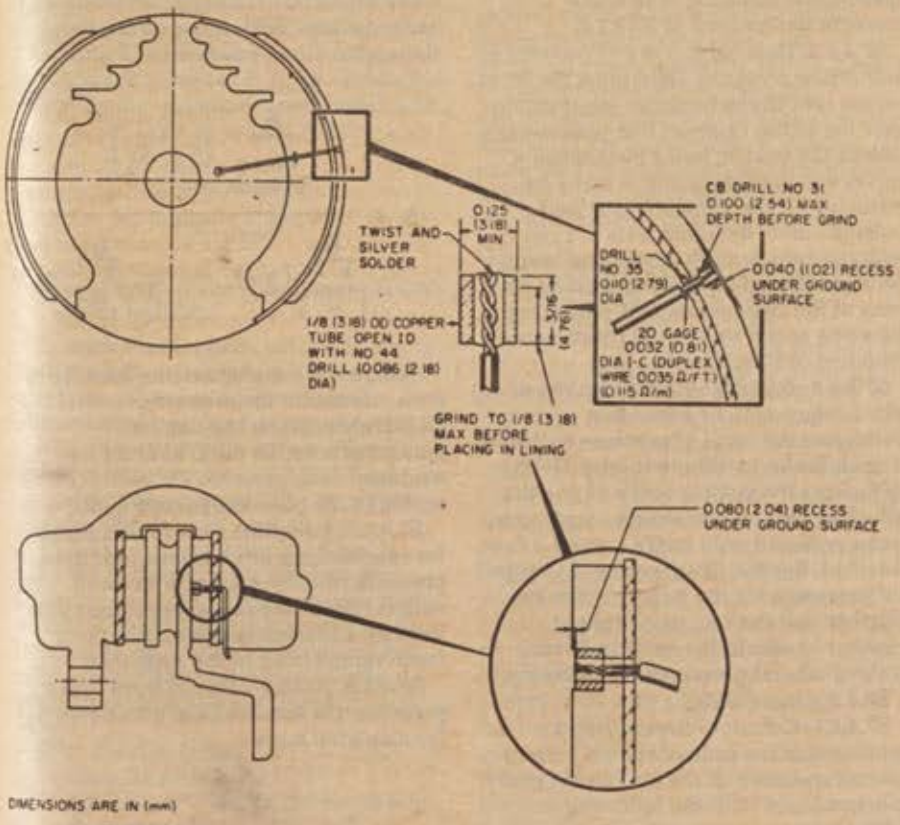
S6.3.5. *Engine.* Engine idle speed and ignition timing settings are according to the manufacturer's recommendations. If the vehicle is equipped with an adjustable engine speed governor, it is adjusted according to the manufacturer's recommendation.

S6.3.6. *Vehicle openings.* All vehicle openings (doors, windows, hood, trunk, convertible top, cargo doors, etc.) are closed except as required for instrumentation purposes.

S6.4. *Instrumentation—Brake temperature.* The brake temperature is measured by plug-type thermocouples installed in the approximate center of the facing length and width the most heavily loaded shoe or disc pad, one per brake, as shown in Fiqure 2. A second thermocouple may be installed at the beginning of the test sequence if the lining wear is expected to reach a point causing the first thermocouple to contact the metal rubbing surface of a drum or rotor. For center-grooved shoes or pads, thermocouples are installed within 3 mm (.12 in) to 6 mm (.24 in) of the groove and as close to the center as possible.

Figure 2

Typical Plug-Type Thermocouple Installations



S6.5. *Procedural conditions.*

S6.5.1. *Vehicle position and attitude.* The vehicle is aligned in the center of the lane at the start of each brake application. Stops are made without any part of the vehicle leaving the lane and without rotation of the vehicle about its vertical axis of more than ±15° from the center line of the test lane at any time during any stop. Steering corrections are permitted.

S6.5.2. *Transmission selector control.* For tests in neutral, the transmission selector control is in neutral for all decelerations. For tests in gear, the transmission selector is in the control position recommended by the manufacturer for driving on a level surface at the applicable test speed. To avoid engine stall during tests required to be run in gear, a manual transmission may be shifted to neutral (or the clutch disengaged) when the vehicle speed is below 30 km/h (18.6 mph).

S6.5.3. *Wheel lockup.* Unless otherwise specified, stops are made without lockup of any wheel at speeds greater than 15 km/h (9.3 mph).

S6.5.4. *Control forces.* Unless otherwise specified, the force applied to a service brake control is not more than 500 N (172.4 lb) nor less than 65 N (14.6 lb).

S6.5.5. *Initial brake temperature.* Unless otherwise specified, the initial brake temperature is 50 °C (122 °F) to 100 °C (212 °F). If the lower limit of initial brake temperature for the first stop in a test sequence (other than a parking brake grade holding test) has not been reached, the brakes are heated to the initial brake temperature by making one or more brake applications from a speed not exceeding 100 km/h (62.1 mph), at a deceleration not greater than 3 m/sec^2 (9.8 ft/sec^2).

S6.5.6. *Stopping distance.* The braking performance of a vehicle is determined by measuring the stopping distance from a given initial speed. Unless otherwise specified and subject to the constraints above, the vehicle is to be stopped in the shortest distance achievable (best effort) on all stops. Where more than one stop is allowed for a given set of test conditions, a vehicle is deemed to comply with the corresponding stopping distance requirements if at least one of the stops is made within the prescribed distance.

S7 *Test procedures and sequence.* Each vehicle shall meet all the applicable requirements of S5 when tested according to the procedures and in the sequence set forth below.

When the transmission selector control is required to be in neutral for a deceleration, a stop or snub is made in accordance with the following procedures: (1) Exceed the test speed by 6 to 12 km/h (3.7 to 7.5 mph); (2) close the throttle and coast in gear to approximately 3 km/h (1.9 mph) above the test speed; (3) shift to neutral; and (4) when the test speed is reached, apply the brakes.

S7.1. *Preparation*

S7.1.1. *Instrumentation.* Install shut-off valves and pressure transducers in the hydraulic system to allow the front and rear brakes to be operated independently and to allow measurement of front and rear brake line pressures. Valves and transducers are located downstream of any proportioning valves.

S7.1.2. *Load vehicle.* Load the vehicle to its GVWR, with the load distributed between the axles in proportion to the GAWR's.

S7.1.3. *Pretest instrumentation check.* Conduct a general check of instrumentation by making 10 stops from a speed of not more than 50 km/h (31.1 mph), at a deceleration of not more than 3 m/sec^2 (9.8 ft/sec^2). The lower force limit of S6.5.4 does not apply to these stops. If instrument repair, replacement, or adjustment is necessary, make not more than 10 additional stops after such repair, replacement, or adjustment.

S7.2. *Service brake system—preburnish effectiveness test.* Make four stops from 100 km/h (62.1 mph).

S7.3. *Service brake system—cold effectiveness test at GVWR.*

S7.3.1. *Burnish.* At the option of the manufacturer, the brakes may be burnished by making 36 stops from 80 km/h (49.7 mph) at a deceleration rate of 3 m/sec^2 (9.8 ft/sec^2), with the transmission selector control in gear.

The lower force limit of S6.5.4 does not apply to these stops. The internal from the start of one service brake application to the start of the next is either the time necessary to reduce the initial brake temperature to 100 °C (212 °F), or the distance of 2 km (1.24 mi), whichever occurs first. Accelerate to 80 km/hr (49.7 mph) after each stop and maintain that speed until making the next stop. After burnishing, adjust the brakes as specified in S6.3.3.

S7.3.2 *Cold effectiveness stops.* Make four stops from 100 km/h (62.1 mph).

S7.3.3. *Reburnish.* At the option of the manufacturer, the brakes may be given an additional burnish of 50 stops according to the procedure specified in S7.3.1.

S7.3.4. *Cold effectiveness stops—retest.* If the optional reburnishing is selected, the four stops from 100 km/hr specified in S7.3.2 are also repeated. For purposes of determining required performance on the hot performance and recovery stops of the fade and recovery sequence, the best performance achieved of all stops in S7.3.2 and S7.3.4 and the corresponding mean pedal force is used as a baseline.

S7.4. *Adhesion utilization tests.*

S7.4.1. *Test procedure.*

S7.4.1.1 *Coast downs in neutral and in gear.* Coast in neutral and determine the time required to decelerate from 55 to 45 km/h (34.2 to 28.0 mph). Make six runs starting from 65 km/h (40.4 mph). Repeat with the transmission in gear appropriate for decelerating from 65 to 45 km/h (40.4 to 28.0 mph).

S7.4.1.2. *Preliminary snubs to determine front and rear brake pressures needed to achieve 6.4 m/sec² (21 ft/sec²) with all brakes operational.* With an initial brake temperature of 50–100 °C (122–212 °F) in each case, make four preliminary snubs to determine the front and rear brake pressures when the vehicle deceleration is 6.4 m/sec² (21 ft/sec²). Accelerate the vehicle to 70 km/h (43.5 mph), coast in gear to 65 km/h (40.4 mph), shift to neutral and apply the brakes at a constant front brake pressure until the vehicle reaches 45 km/h (28.0 mph). For subsequent snubs, adjust the brake pressure so that the deceleration time from 55 to 45 km/h (34.2 to 28.0 mph), is between .40 seconds and .46 seconds. The front and rear brake pressures for the snub having a deceleration time closest to 0.43 seconds are used in the front-only and rear-only brake tests which follow.

S7.4.1.3 *Front brake only test.* Make six snubs, in neutral, at the constant front brake pressure determined in S7.4.1.2, using the same initial brake temperatures. Determine the average value of the brake pressure actually maintained between 55 and 45 km/h (34.2 and 28.0 mph) for each snub, by recording brake pressure versus time. Record deceleration times from 55 to 45 km/h (34.2 to 28.0 mph) for each snub.

S7.4.1.4. *Rear brake only test.* Repeat S7.4.1.3 with only the rear brakes operational using the rear brake pressure determined in S7.4.1.2.

S7.4.1.5. *Determination of front versus rear brake pressure.* Determine the front versus rear brake pressure relationship over the entire range of line pressures. Unless the vehicle has a load sensing valve, this determination is made by static test. If the vehicle has a load sensing valve, dynamic tests are run with the vehicle both empty and loaded. Between 20 and 25 snubs are made for each of the two load conditions, using the same speed and initial conditions specified in S7.4.1.2.

S7.4.1.6. *Determination of front and rear brake push-out pressures.* Determine the level of pressure required at each brake to initiate torque. Do this by jacking the vehicle and rotating the wheel by hand while slowly increasing brake pressure until brake torque is first detected. Record the pressure. Average the pressures for the two front brakes together and the two rear brakes together to obtain the front and rear brake push-out pressures respectively.

S7.4.2. *Calculations.*

S7.4.2.1. Calculate the coastdown deceleration for each of the six runs in neutral and each of the six runs in gear in accordance with the following formula:

$$Z = \frac{2.778}{tg}$$

Where Z = deceleration (g), g = 9.8 m/sec² and t = time (seconds) to decelerate from 55 to 45 km/h (34.2 to 28.0 mph). Average the six coastdown decelerations in neutral (= coast in neutral) and the six coast-down decelerations in gear (= coast in gear).

S7.4.2.2. Determine the decelerations as in S7.4.2.1 for the front brakes only tests and the rear brakes only tests. Subtract the average coastdown deceleration in neutral from each of the six decelerations in each test series.

S7.4.2.3. Determine the front and rear braking forces from each of the six decelerations in each test series by:

$T = PZ$

Where T = braking force (N), P = total vehicle weight (N), and Z is the deceleration (g).

S7.4.2.4. Determine the braking force versus brake pressure relationship for the front brakes and for the rear brakes as follows:

Fit a straight line through the push-out pressure, zero force point and the group of six pressure, force data points determined in the snubs. The group of six data points is fit using the method of least squares. With this method, the slope of the line is defined as follows:

$$s = \frac{\sum_{i=1}^{6} (T_i x_i)}{\sum_{i=1}^{6} (x_i)^2 - x_0 \sum_{i=1}^{6} x_i}$$

Where s is the slope of the braking force versus brake pressure relationship (N/MPa), T_i is the braking force measured on snub i (N), x_i is the average brake pressure for snub i (MPa) and x_0 is the push-out pressure (MPa).

S7.4.2.5. Using the linear relationship for rear braking force versus rear brake pressure from S7.4.2.4 and the front versus rear brake pressure relationship from S7.4.1.5, determine rear braking force versus front brake prsessure.

S7.4.2.6. At any value of front brake pressure, the total vehicle deceleration is calculated from:

$$Z_T = \frac{T_1 + T_2}{P} + Z_{\text{coast in gear}}$$

Where Z_T = total vehicle deceleration (g), T_1 = front braking force (N) at the given front brake pressure, T_2 = rear braking force corresponding to the same front brake pressure, P = total vehicle weight (N), and $Z_{\text{coast in gear}}$ is the average coastdown deceleration in gear.

S7.4.2.7. At any level of front brake pressure, the adhesion utilization of the brakes on both axles is calculated from:

$$f_1 = \frac{T_1 + D}{P_1 + Z_T \frac{h}{E} P}$$

$$f_2 = \frac{T_2 + D}{P_2 - Z_T \frac{h}{E} P}$$

Where f_1 = adhesion utilization of the front axle, f_2 = adhesion utilization of the rear axle, P_1 = static weight on the front

axle (N), P_2 = static weight on the rear axle (N), h = center of gravity height (mm), E = vehicle wheelbase (mm), D = engine and drive train drag such that:

For non-driving axle: D = O
For the driving axle:
$D = P[Z_{coast\ in\ gear} - Z_{neutral}]$

S7.4.2.8. The adhesion utilization for all other states of load is determined by repeating S7.4.2.6 and S7.4.2.7 using appropriate values of P, P_1, P_2 and h, and adjusting the coastdown deceleration in gear by multiplying it by the ratio:

$$\frac{P_s \text{test weight}}{P_{desired\ weight}}$$

(Values of T_1, T_2, D and E are independent of vehicle loading).

S7.4.2.9. Plot f_1 and f_2 versus Z_T for both the laden and the unladen condition. These are the adhesion utilization curves for the in-gear case.

S7.5. *Service brake system—high speed effective tests at GVWR.* Make 4 stops from 80 percent of the maximum speed of the vehicle, in gear.

S7.6 *Stops with engine off.* (For vehicles equipped with one or more brake power units or brake power assist units). Make four stops from 100 km/h (62.1 mph), in neutral, with the engine not running. All reservoirs are fully charged prior to the beginning of each stop.

S7.7. *Service brake system—cold effectiveness tests at LLVW.*

S7.7.1. *Unload vehicle.* Decrease the vehicle load to LLVW.

S7.7.2. *Cold effectiveness stops.* Make four stops from 100 km/h (62.1 mph).

S7.8. *Service brake system—high speed effectiveness tests at LLVW.* Make 4 stops from 80 percent of the maximum speed of the vehicle, in gear.

S7.9. *Partial system test at LLVW.*

S7.9.1. *Circuit failure.* Alter the service brake system to produce any one rupture or leakage type of failure, other than a structural failure of a housing that is common to two or more subsystems. Determine the control force, pressure level, or fluid level (as appropriate for the indicator being tested) necessary to activate the brake warning indicator. After the brake warning indicator has activated, make four stops if the vehicle is equipped with a split service brake system or 10 stops if the vehicle is not so equipped, each from 100 km/h (62.1 mph) in neutral, by a continuous application of the service brake control. Restore the service brake system to normal at the completion of this test. Repeat the entire sequence for each of the other subsystems.

S7.9.2. *Failed anti—lock or variable proportioning system.* (For vehicles equipped with anti-lock and/or variable proportioning brake systems). Disconnect the functional power source, or otherwise render the anti-lock system inoperative, or disconnect the variable proportioning brake system. Make four stops, each from 100 km/h (62.1 mph). Determine whether the brake system indicator is activated when any electrical power source to the ant-lock or variable proportioning unit is disconnected. Restore the system to normal at the completion of this test. If more than one anti-lock or variable proportioning brake subsystem is provided repeat for each subsystem provided.

S7.10. *Partial system tests at GVWR.*

S7.10.2. *Load vehicle.* Restore the vehicle to its GVWR loading.

S7.10.2. *Circuit failure.* Repeat S7.9.1.

S7.10.3. *Failed anti-lock or variable proportioning system.* Repeat S7.9.2.

S7.10.4. *Inoperative brake power assist unit or brake power unit.* (For vehicles equipped with one or more brake power units or brake power assist units). Disconnect the primary source of power for one brake power assist unit or brake power unit, or one of the brake power unit or brake power assist unit subsystems if two or more subsystems are provided. If the brake power or brake power assist unit operates in conjunction with a backup system and the backup system is automatically activated in the event of a primary power source failure, the backup system is operative during this test. Exhaust any residual brake power reserve capability of the disconnected system. On vehicles with brake power units, disconnect the primary source of power. Make four stops, each from 100 km/h (62.1 mph) by a continuous application of the service brake control. Restore the system to normal at completion of this test. For vehicles equipped with more than one brake power unit or brake power assist unit, conduct tests for each in turn.

S7.11. *Fade and recovery tests (GVWR).*

S7.11.1. *Heating snubs.* [Proposed alternative 1] Make 80 snubs from 55 km/h to 25 km/h (34.2 to 15.6 mph), at a constant deceleration rate of 2.4 m/sec² (7.9 ft/sec²). The lower force limit in S6.5.4 does not apply to these snubs. Establish and initial brake temperature before the first brake application of 55 to 65°C (131 to 149°F). Initial brake temperatures before brake applications for subsequent stops are those occurring at the distance intervals. Attain the required deceleration within one second and, as a minimum, maintain it for the remainder of the snub. Maintain an interval of 15 seconds between the start of brake applications. Accelerate as rapidly as possible to the initial test speed immediately after each snub. Immediately after the 80th snub, accelerate to 100 km/h (62.1 mph) to commence the hot performance test.

[Proposed alternative 2] Make 15 snubs from 120 km/h (74.6 mph) or 80% of the maximum speed of the vehicle, whichever is slower, to one-half the initial speed. Maintain a constant deceleration rate of 3.0 m/sec² (9.8 ft/sec²). The lower force limit in S6.5.4 does not apply to these snubs. Establish an initial brake temperature before the first brake application of 55 to 65°C (131 to 149°F). Initial brake temperatures before brake applications for subsequent stops are those occurring at the distance intervals. Attain the required deceleration within one second and, as a minimum, maintain it for the remainder of the snub. Maintain an interval of 30 seconds between the start of brake applications. Accelerate as rapidly as possible to the initial test speed immediately after each snub. Immediately after the 15th snub, accelerate to 100 km/h (62.1 mph) to commence the hot performance test.

S7.11.2 *Hot performance test.* Make one stop from 100 km/h (62.1 mph), in neutral, at a pedal force not greater than the mean pedal force actually measured on the best cold performance stop in either S7.3.2 or S7.3.4. Immediately after the stop, drive 1.5 km (.93 mi) at 50 km/h (31.1 mph) before the first cooling stop.

S7.11.3. *Brake cooling.* Make four stops from 50 km/h (31.1 mph), in gear, at a constant deceleration rate of 3.0 m/sec² (9.8 ft/sec²). The lower force limit in S6.5.4 does not apply to these stops. Immediately after the first through third stops, the vehicle shall be accelerated at the maximum rate to 50 km/h (31.1 mph) and that speed maintained until beginning the next stop at a distance of 1.5 km (0.95 mi) since the beginning of the previous stop. Immediately after the fourth stop, accelerate the vehicle at the maximum rate to 100 km/h (62.1 mph) and maintain that speed until beginning the recovery performance stop at distance of 1.5 km (0.93 mi) after the beginning of the fourth cooling stop.

S7.11.4. *Recovery performance test.* Make one stop from 100 km/h (62.1 mph), under the same conditions as for the hot performance test in S7.11.2.

S7.12. *Parking brake performance.*

S7.12.1. *Conditions.*

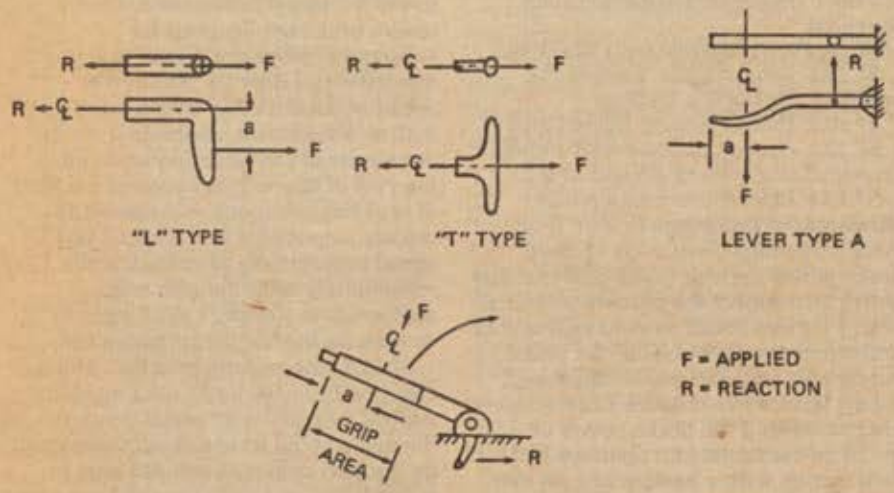
S7.12.1.1. *Application force.* The parking brake shall be actuated by a single application not exceeding the limits specified in S5.3, except that a series of applications to achieve the

specified force may be made in the case of a parking brake system design that does not allow the application of the specified force in a single application. The force required for actuation of a hand-operated brake system shall be measured at the center of the hand grip area or at a distance of 40 mm (1.57 in) from the end of the actuation level, as illustrated in Figure 3.

Figure 3

Location for Measuring Brake Application Force

(Hand Brake)



Dimension a = 40mm (1.57 in)

S7.12.1.2. The lower temperature limit of S6.5.5 does not apply to the test in S7.12.2 and S7.12.3.

S7.12.1.3. For vehicles with parking brake systems not utilizing the service brake friction elements, the friction elements of such a system are burnished prior to the parking brake tests, according to the published recommendations furnished to the purchaser by the manufacturer. If no recommendations are furnished, the vehicle's parking brake is tested in an unburnished condition.

S7.12.2. *Gradient Hold.* Drive the vehicle onto a 20 percent grade with the longitudinal axis of the vehicle in the direction of the slope of the grade, stop the vehicle and hold it stationary by application of the service brake control, and place the transmission in neutral. With the service brake applied sufficiently to just keep the vehicle from rolling, apply the parking brake as specified in S7.12.1.1. Following the application of the parking brake, release all force on the service brake control and, if the vehicle remains stationary, start the measurement of time. If the vehicle does not remain stationary, reapplication of a force to the parking brake control at the level specified in S7.12.1.1 as appropriate for the vehicle being tested (without release of the ratcheting or other holding mechanism of the parking brake) may be used twice to attain a stationary position. Verify the operation of the parking brake application indicator. Following observation of the vehicle in a stationary condition for the specified time in one direction, repeat the same test procedure with the vehicle orientation in the opposite direction on the same grade.

S7.12.3. *Dynamic test.* Make one stop from 60 km/h (37.3 mph), in neutral, with a force applied to the parking brake control not exceeding the values specified in S7.12.1.1. If the required performance is not achieved, a second attempt is permitted.

S7.13. *Spike stops.* Make 10 successive spike stops from 50 km/h (31.1 mph) with the transmission in neutral, with no reverse stops. Make the spike stops by applying a control force of 900 N (202.3 lb) while recording control force versus time. Maintain the control force until the vehicle has stopped. The prohibition of wheel lockup in S6.5.3 does not apply to this test.

S7.14. *Service brake system-Final effectiveness test.* Make four stops from 100 km/h (62.1 mph).

S7.15. *Final inspection.* Inspect—

(a) The service brake system for detachment or fracture of any components, such as brake springs and brake shoes or disc pad facing.

(b) The friction surface of the brake, the master cylinder or brake power unit reservoir cover, and seal and filler openings, for leakage of brake fluid or lubricant.

(c) The master cylinder or brake power unit reservoir for compliance with the volume and labeling requirements of S5.4.4.2 and S5.4.4.3. In determining the fully applied worn condition, assume that the lining is worn to (1) rivet or bolt heads on riveted or bolted linings or (2) within 0.8 mm (1/32 inch) of shoe or pad mounting surface on bonded linings, or (3) the limit recommended by the manufacturer, whichever is larger relative to the total possible shoe or pad movement. Drums or rotors are assumed to be at nominal design drum diameter or rotor thickness. Linings are assumed adjusted for normal operating clearance in the released position.

(d) The brake system indicators, for compliance with operation in various key positions, lens color, labeling, and location, in accordance with S5.4.5.

Issued on May 3, 1985.

Barry Felrice,

Associate Administrator for Rulemaking.

[FR Doc. 85-11402 Filed 5-7-85; 3:43 pm]

BILLING CODE 4910-59-M

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; Findings on Pending Petitions and Description of Progress on Listing Actions

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of findings on pending petitions and description of progress on listing actions.

SUMMARY: The Service announces its findings on pending petitions to revise the Lists of Endangered and Threatened Wildlife and Plants. These findings must be made within one year of the date of receipt of such a petition or of a previous positive finding. The Service also describes its progress in revising the lists during the period from October 13, 1983 to October 12, 1984.

DATES: The findings announced in this notice were made on October 12, 1984. The description of the Service's progress in revising the lists is current as of October 13, 1984.

FOR FURTHER INFORMATION CONTACT: Mr. John L. Spinks, Jr., Chief, Office of Endangered Species, U.S. Fish and Wildlife Service, Washington, D.C. 20240 (703/235-2771 or FTS 235-2771).

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(B) of the Endangered Species Act of 1973, as amended in 1982 (16 U.S.C. 1531 *et seq.*), requires that, for any petition to revise the Lists of Endangered and Threatened Wildlife and Plants that contains substantial scientific or commercial information, a finding be made on the merits within 12 months of the date of receipt of the petition. Provisions at section 2(b)(1) of the Endangered Species Act Amendments of 1982 (hereafter called Amendments) require that petitions pending on the date of enactment of the Amendments (hereafter called pending petitions) be treated as having been filed on that date. Findings (hereafter called 12-month findings) on these petitions were therefore made on October 13, 1983, and reported in the **Federal Register** of January 20, 1984 (49 FR 2485). This notice reports findings made on October 12, 1984, on pending petitions, and descirbes the Service's progress in revising the Lists of Endangered and Threatened Wildlife and Plants during the second year following the enactment of the Amendments.

Findings

The petitions that are the subjects of this notice are ones that the Service initially determined had presented substantial scientific or commercial information indicating that the petitioned action may be warranted. Some of these determinations were made and announced in the **Federal Register** before the enactment of the Amendments. A series of such determinations was announced in the **Federal Register** of February 15, 1983 (48 FR 6752). The remainder of the initial findings for taxa considered here were announced in the **Federal Register** on January 16, 1984 (49 FR 1919).

Section 4(b)(3)(B) of the Act requires that the Service make one of the following 12-month findings on each petition containing substantial information: (i) The petitioned action is not warranted; (ii) the petitioned action is warranted and the petitioned action will be proposed promptly; or (iii) the petitioned action is warranted but precluded by other efforts to revise the lists, and expeditious progress is being made in listing and delisting species.

Petitioned actions found to be warranted [(ii) above] are the subjects of proposals that will be published or have already been published in the **Federal Register.** Findings of "not warranted" and "warranted but precluded" [(i) and (iii) above, respectively] for pending petitions are reported here.

The Service's 12-month findings of "not warranted" and "warranted but precluded" on pending petitions for U.S. native animal taxa are given in Table 1. Petitioned actions that are found to be not warranted are indicated by the word "No" in the "Warranted?" column opposite the name of the affected species. Species that are the subjects of petitioned actions that are found to be warranted but precluded are designated with either "Yes" or "Yes*" corresponding to categories 1 and 2, respectively, in the general animal notices of review. The general notice for vertebrate animals was published on December 30, 1982 (47 FR 58454), and can be consulted on the definitions of these category designations. The general notice on invertebrate animals was published on May 22, 1984 (49 FR 21664).

TABLE 1.—CURRENT 12-MONTH FINDINGS ON PENDING ANIMAL PETITIONS

Species	Petitioner	Date	Warranted
Carolina sponge, *Corvomeyenia carolinensis*	Ronald M. Cowden	June 17, 1974	Yes*
Oklawaha sponge, *Dosilla petrneri*	do	do	Yes*
Kissimmee sponge, *Ephydatia subtilis*	do	do	Yes*
Pennsylvania sponge, *Heteromeyenia longistylis*	do	do	Yes*
Oneida sponge, *Spongilla heterosterila*	do	do	Yes*
Central Missouri cave amphipod, *Allocrangonyx hubrichti*	National Speleological Society	Sept. 9, 1974	Yes*
Oklahoma cave amphipod, *Allocrangonyx pellucidus*	do	do	Yes*
Pennsylvania cave amphipod, *Crangonyx dearolfi*	do	do	Yes*
Hobbs cave amphipod, *Crangonyx hobbsi*	do	do	Yes*
Illinois cave amphipod, *Gammarus acherondytes*	do	do	Yes*
Bousfield's amphipod, *Gammarus bousfieldi*	do	do	Yes*
Noel's amphipod, *Gammarus desperatus*	do	do	Yes*
Diminutive amphipod, *Gammarus hyalleloides*	do	do	Yes*
Pecos amphipod, *Gammarus pecos*	do	do	Yes*
Tidewater interstitial amphipod, *Stygobromus araeus*	do	do	Yes*
Arizona cave amphipod, *Stygobromus arizonensis*	J. Holsinger	July 12, 1974	Yes*
Balcones cave amphipod, *Stygobromus balconis*	National Speleological Society	Sept. 9, 1974	Yes*
Barr's cave amphipod, *Stygobromus barri*	do	do	Yes*
Bifurcated cave amphipod, *Stygobromus bifuractus*	do	do	Yes*
Bowman's cave amphipod, *Stygobromus bowmani*	do	do	Yes*
Clanton's cave amphipod, *Stygobromus clantoni*	do	do	Yes*
Bournsville Cove cave amphipod, *Stygobromus conradi*	do	do	Yes*
Cooper's cave amphipod, *Stygobromus cooperi*	do	do	Yes*
Cascade Cave amphipod, *Stygobromus dejectus*	do	do	Yes*
Elevated Spring amphipod, *Stygobrorgus elatus*	do	do	Yes*
Greenbriar Cave amphipod, *Stygobromus emarginatus*	do	do	Yes*
Ephemeral cave amphipod, *Stygobromus emphemerus*	do	do	Yes*
Ezell's Cave amphipod, *Stygobromus flagellatus*	do	do	Yes*

TABLE 1.—CURRENT 12-MONTH FINDINGS ON PENDING ANIMAL PETITIONS—Continued

Species	Petitioner	Date	Warranted
Grady's cave amphipod, *Stygobromus gradyi*	J. Holsinger	July 12, 1974	Yes*
Devil's Sinkhole amphipod, *Stygobromus hadenoecus*	National Speleological Society	Sept. 9, 1974	Yes*
Hara's cave amphipod, *Stygobromus harai*	J. Holsinger	July 12, 1974	Yes*
(No common name), *Stygobromus heteropodus*	National Speleological Society	Sept. 9, 1974	Yes*
Malheur Cave amphipod, *Stygobromus hubbsi*	J. Holsinger	July 12, 1974	Yes*
Tidewater amphipod, *Stygobromus indentatus*	National Speleological Society	Sept. 9, 1974	Yes*
Long-legged cave amphipod, *Stygobromus longipes*	do	do	Yes*
MacKenzie's cave amphipod, *Stygobromus mackenziei*	J. Holsinger	July 12, 1974	Yes*
Mountain cave amphipod, *Stygobromus montanus*	National Speleological Society	Sept. 9, 1974	Yes*
Morrison's cave amphipod, *Stygobromus morrisoni*	do	do	Yes*
Bath County cave amphipod, *Stygobromus mundus*	do	do	Yes*
Norton's cave amphipod, *Stygobromus nortoni*	do	do	Yes*
Onodaga Cave amphipod, *Stygobromus onondagaensis*	do	do	Yes*
Ozark cave amphipod, *Stygobromus ozarkensis*	do	do	Yes*
Minute cave amphipod, *Stygobromus parvus*	do	do	Yes*
Peck's cave amphipod, *Stygobromus pecki*	do	do	Yes*
Pizzini's amphipod, *Stygobromus pizzini*	do	do	Yes*
Wisconsin well amphipod, *Stygobromus putealis*	do	do	Yes*
Redell's cave amphipod, *Stygobromus redelli*	do	do	Yes*
Alabama well amphipod, *Stygobromus smithi*	do	do	Yes*
Spring cave amphipod, *Stygobromus spinatus*	do	do	Yes*
Stellmack's cave amphipod, *Stygobromus stellmacki*	do	do	Yes*
Subtle cave amphipod, *Stygobromus subtilis*	do	do	Yes*
Wengerors' cave amphipod, *Stygobromus wengerorum*	J. Holsinger	July 12, 1974	Yes*
Alabama cave shrimp, *Palaemonias alabamae*	National Speleological Society	Sept. 9, 1974	Yes*
Palm Springs Cave crayfish, *Procambarus acherontis*	do	do	Yes*
Texas cave shrimp, *Palaemonetes antrorum*	do	do	Yes*
Squirrel Chimney cave shrimp, *Palaemonetes cummingi*	do	do	Yes
Dolloff Cave spider, *Meta dolloff*	Thomas S. Briggs	Oct. 25, 1983	No
Columbia River tiger beetle, *Cicindela columbica*	Gary Shook	Dec. 15, 1979	Yes*
Uncompahgre fritillary butterfly, *Boloria acronema*	Lawrence F. Gall	Nov. 5, 1979	Yes
San Francisco tree lupine moth, *Grapholita edwardsiana*	Richard Arnold and Jerry R. Powell	Dec. 12, 1982	Yes*
Wiest's sphinx moth, *Euproserpinus wiesti*	Jo Brower	Jan. 26, 1981	Yes
Bliss Rapids snail, Genus and species undescribed	Peter A. Bowler	Feb. 7, 1980	Yes
Snake River physa snail, *Physa sp.*	do	do	Yes
Bonneville cutthroat trout, *Salmo clarki utah*	P.G. Sanchez, Desert Fishes Council	Oct. 23, 1979	Yes
Shoshone sculpin, *Cottus greenei*	Peter A. Bowler	Dec. 13, 1979	Yes*
Puerto Rican sharp-shinned hawk, *Accipiter striatus venator*	Internat. Counc. Bird Preservation	Nov. 24, 1980	Yes*
Puerto Rican broad-winged hawk, *Buteo platypterus brunnescens*	do	do	Yes*
Radak Micronesian pigeon, *Ducula oceanica ratakensis*	do	do	Yes*
Truk Micronesian pigeon, *Ducula oceanica teraoki*	do	do	Yes*
Mariana fruit dove, *Ptilinopus roseicapillus*	do	do	Yes*
Palau Nicobar pigeon, *Caloenas nicobarensis pelewensis*	do	do	Yes*
Virgin Islands screech owl, *Otus nudipes newtoni*	do	do	Yes
Ponape short-eared owl, *Asio flammeus ponapensis*	do	do	Yes*
Truk monarch, *Metabolus rugensis*	do	do	Yes*
Guam rufous-fronted fantail, *Rhipidura rufifrons uraniae*	Paul M. Calvo, Governor of Guam	Dec. 23, 1981	Yes
Palau white-breasted wood-swallow, *Aretamus leucorhynchus pelewensis*	Internat. Counc. Bird Preservation	Nov. 24, 1980	Yes*
Rota bridled white-eye, *Zosterops conspicillata rotensis*	do	do	Yes*
Truk greater white-eye, *Rukia ruki*	do	do	Yes*
Least Bell's vireo, *Vireo bellii pusillus*	James M. Graves	Nov. 8, 1979	Yes
Amak song sparrow, *Melospiza melodia amaka*	Internat. Counc. Bird Preservation	Nov. 24, 1980	Yes*
Palau blue-faced parrotfinch, *Erythrura trichroa pelewensis*	do	do	Yes*
Silver rice rat, *Oryzomys argentatus*	Center for Action on Endangered Species	April 12, 1980	Yes*

An additional finding of "warranted but precluded" is reported here in the case of 58 foreign bird species for which listing was petitioned in 1980 by Dr. Warren B. King, Chairman, United States Section, International Council for Bird Preservation. The Service published a notice of review for these species on May 12, 1981 (46 FR 26464). Readers should refer to that notice for the names of the species involved.

A finding of "not warranted" in regard to a petition to list *Meta dollof* (Dollof Cave spider) requires some additional explanation of circumstances that favor continuation of a status review for this species. At the time the petition was submitted, the presence and restricted known distribution of this organism had not been given specific consideration in a planning process underway for development of lands belonging to the University of California in Santa Cruz County, California. At the same time, its distribution and biology have received very little systematic scientific investigation at all. The petition by Thomas S. Briggs acknowledged these unknowns both in our biological understanding and in the directions that possible threats might take. However, without specifically considering this animal, all the planning documentation that has been made public to date includes ecological considerations for its environment, and the likely immediate threats have not materialized. Because of the apparent absence of direct threats, the existence of one more known colony that can be added to the two described in the petition, and the need for further understanding of its distribution and biology, the Service considers the petitioned listing of the Dollof Cave spider not to be warranted at this time. As in the situation for the alligator snapping turtle discussed in the **Federal Register** for February 29, 1984 (49 FR 7416), however, the Service also continues to regard *Meta dollof* as a possible candidate for future listing as endangered or threatened (category 2 in the general notice of review).

"Not warranted" and "warranted but precluded" findings for pending plant petitions are announced in this notice by categories; their application to individual taxa is published in a notice of review for plants in the December 15, 1980, **Federal Register** (45 FR 82480) as updated in a supplementary notice of review in the November 28, 1983, **Federal Register** (48 FR 53670). The plant notice category number opposite the name of each taxon that is the subject of a pending petition indicates the Service's finding on that taxon. Findings of "not warranted" on the petitioned action are hereby reported by the designation of subcategories 3A, 3B, or 3C for such taxa. Findings of "warranted

but precluded" are hereby reported by the designation of category 1, 1*, 1**, 2, or 2* for such subject taxa. The complete definitions of these category numbers are described in the supplement to the 1980 general plant notice (45 FR 82479).

The following eleven plant species, placed in categories 1 or 2 in the 1980 notice of the 1983 supplement, were found not to warrant listing in 1984: *Arabis* sp. nov. ined. (Gray Knolls, Uintah Co., Utah), *Astragalus barnebyi, Astragalus lutosus, Astragalus striatiflorus, Cryptantha jonesiana, Eriogonum lancifolium, Opuntia basilaris* var. *woodburyi, Penstemon nanus, Sclerocactus spinosior,* and *Sphaeralcea caespitosa.*

Section 4(b)(3)(C)(i) of the Act requires that a petition found to be warranted but precluded be treated as an accepted petition newly submitted on the date of the finding. A finding on such a petition must then be made again within 12 months of the date of the last 12-month finding.

Progress in Revision of the Lists

Section 4(b)(3)(B)(iii) of the Act states that petitioned actions may be found to be warranted but precluded by other listing actions when it is also found that the Service is making expeditions progress in revising the lists. The Service's progress in revising the lists in the year following October 13, 1983, the current date of the previous report, is described in this section of the present notice. The described activities prevented immediate action on the "warranted but precluded" petitioned actions.

The Service has complied with section 4 by publishing revised regulations covering listing procedures under the Act (codified at 50 CFR Part 424, see 49 FR 38900, October 1, 1984) to comply with the Amendments. Provisions of the Amendments that address the handling of petitions have made it necessary for the Service to implement extensive new procedures for conforming to deadlines and making findings on petitions. These internal procedures have been set down by the Service in a June 15, 1984, document entitled *Petition Management Guidelines,* which is available from the Service on request (see **"FOR FURTHER INFORMATION CONTACT:** above).

The Service's progress in revising the lists during the 12-month period following October 13, 1983, is represented by the publication in the **Federal Register** of final listing actions on 52 species, proposed listing actions on 62 species, and emergency listings on 2 species. The number of species affected by each type of listing action published during this period is presented in Table 2.

TABLE 2.—LISTING ACTIONS DURING THE PERIOD OCT. 14, 1983 THROUGH OCT. 13, 1984

Type of action	Number of species affected
Emergency endangered status	2
Final endangered status with critical habitat	2
Final endangered status	37
Final threatened status with critical habitat	3
Final threatened status	1
Final designation of critical habitat	1
Final removal from lists	4
Final change from threatened to endangered status	1
Final change from endangered to threatened status	3
Proposed endangered status with critical habitat	21
Proposed threatened status with critical habitat	10
Proposed endangered status	20
Proposed threatened status	8
Proposed change from endangered to threatened status	1
Proposed change from threatened to threatened due to similarity of appearance	1
Proposed removal from lists	1

As of October 13, 1984, the Service's Washington Office of Endangered Species was also reviewing documents that would propose or make final listing actions on 63 species. The type of action and numbers of affected species are given in Table 3.

TABLE 3.—POSSIBLE LISTING ACTIONS FOR WHICH THE SERVICE WAS REVIEWING DRAFT DOCUMENTS ON OCT. 13, 1984

Type of action	Number of species affected
Final endangered status with critical habitat	5
Final endangered status	2
Final threatened status	2
Final designation of critical habitat	1
Proposed endangered with critical habitat	22
Proposed threatened with critical habitat	8
Proposed endangered status	16
Proposed threatened status	2
Proposed change from endangered to threatened status	2
Proposed removal from lists	3

The Service has also identified 190 species for which listing documents are to be developed during the fiscal year beginning October 1, 1984. The numbers of species affected and types of listing actions are given in Table 4. The Service anticipates that listing actions in addition to these will be identified during the fiscal year.

TABLE 4.—POSSIBLE LISTING ACTIONS FOR WHICH THE SERVICE EXPECTS TO DEVELOP DRAFT LISTING DOCUMENTS DURING THE FISCAL YEAR BEGINNING OCT. 1, 1984.

Type of action	Number of species affected
Final endangered status with critical habitat	25
Final endangered status	5
Final threatened status with critical habitat	9
Final threatened status	8
Proposed endangered status with critical habitat	9
Proposed threatened status with critical habitat	7
Proposed endangered status	96
Proposed threatened status	7
Final change from threatened to threatened due to similarity of appearance	1
Proposed change from endangered to threatened status	5
Proposed change from endangered and threatened to threatened due to similarity of appearance	1
Proposed revision of critical habitat	1
Final removal from lists	1
Proposed removal from lists	15

The Service also funded status surveys for 173 species during the 12-month period following October 13, 1983. These surveys are designed to gather any additional data needed to make a determination on whether the subject species are eligible for protection under the Act.

Author

This notice was prepared by Dr. George Drewry, Office of Endangered Species, U.S. Fish and Wildlife Service, Washington, D.C. 20240 (703/235–1975 or FTS 235–1975).

Authority

The authority for this action is the Endangered Species Act (16 U.S.C. 1531 *et seq.*; Pub. L. 93–205, 87 Stat. 884; Pub. L. 94–359, 90 Stat. 911; Pub. L. 95–632, 92 Stat. 3751; Pub. L. 96–159, 93 Stat. 1225; Pub. L. 97–304, 96 Stat. 1411).

List of Subjects in 50 CFR Part 17

Endangered and threatened wildlife, Fish, Marine mammals, Plants (agriculture).

Dated: May 3, 1985.

Susan Reece,

Acting Assistant Secretary for Fish and Wildlife and Parks.

[FR Doc. 85–11409 Filed 5–9–85; 8:45 am]

BILLING CODE 4310–55–M