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U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

LABORATORY TEST PROCEDURE

FOR

FMVSS 105

Hydraulic Brake Systems



SAFETY ASSURANCE
Office of Vehicle Safety Compliance
Room 6115, NSA-30
400 Seventh Street, SW
Washington, DC 20590

**OVSC LABORATORY TEST PROCEDURE NO. 105
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1. PURPOSE AND APPLICATION

The Office of Vehicle Safety Compliance (OVSC) provides contracted laboratories with Laboratory Test Procedures (TPs) which serve as guidelines for obtaining compliance test data. The data are used to determine if a specific vehicle or item of motor vehicle equipment meets the minimum performance requirements of the subject Federal Motor Vehicle Safety Standard (FMVSS). The purpose of the OVSC Laboratory Test Procedures is to present a uniform testing and data recording format, and provide suggestions for the use of specific equipment and procedures. Any contractor interpreting any part of an OVSC Laboratory Test Procedure to be in conflict with a Federal Motor Vehicle Safety Standard or observing any deficiencies in a Laboratory Test Procedure is required to advise the Contracting Officer's Technical Representative (COTR) and resolve the discrepancy prior to the start of compliance testing.

Contractors are required to submit a detailed test procedure to the COTR before initiating the compliance test program. The procedure must include a step-by-step description of the methodology to be used.

The OVSC Laboratory Test Procedures are not intended to limit or restrain a contractor from developing or utilizing any testing techniques or equipment, which will assist in procuring the required compliance test data.

NOTE:

The OVSC Laboratory Test Procedures, prepared for use by independent laboratories under contract to conduct compliance tests for the OVSC, are not intended to limit the requirements of the applicable FMVSS(s). In some cases, the OVSC Laboratory Test Procedures do not include all of the various FMVSS minimum performance requirements. Sometimes, recognizing applicable test tolerances, the Test Procedures specify test conditions, which are less severe than the minimum requirements of the standards themselves. Therefore, compliance of a vehicle or item of motor vehicle equipment is not necessarily guaranteed if the manufacturer limits certification tests to those described in the OVSC Laboratory Test Procedures.

2. GENERAL REQUIREMENTS

This standard specifies requirements for hydraulic service brake and associated parking systems in order to insure safe braking performance under normal and emergency conditions.

The service brakes shall be capable of stopping each vehicle in effectiveness tests within specific distances and speeds. Also, the vehicle shall be capable of stopping under partial failure of the service brake system and an inoperative brake power assist unit or brake power unit, if applicable.

Each vehicle shall be manufactured with a parking brake system which, when engaged, shall be capable of holding the vehicle stationary on a graded surface for a specified time, and, for vehicles which are equipped with a transmission which incorporates a parking mechanism, be capable of remaining stationary when impacted by a barrier moving at two and a half mph.

Each vehicle shall have one or more brake system indicator lamps, mounted in front of and in clear view of the driver. Indicator lamps shall be activated both when certain vehicle conditions occur and when the ignition switch is turned to a certain position as a check of lamp function.

Each vehicle shall have a specific brake fluid warning statement located on or near the brake fluid reservoir filler plug or cap.

Each vehicle shall be capable of completing all performance requirements without detachment or fracture of any component of the braking system and any visible brake fluid or lubricant on the friction surface of the brake, or leakage at the master cylinder or brake power unit reservoir cover, seal, and filler openings.

3. SECURITY

The contractor shall provide appropriate security measures to protect the OVSC test vehicles from unauthorized personnel during the entire compliance-testing program. The contractor is financially responsible for any acts of theft and/or vandalism, which occur during the storage of test vehicles. Any security problems, which arise, shall be reported by telephone to the Industrial Property Manager (IPM), Office of Contracts and Procurement, within two working days after the incident. A letter containing specific details of the security problem will be sent to the IPM (with copy to the COTR) within 48 hours. The contractor shall protect and segregate the data that evolves from compliance testing before and after each vehicle test. No information concerning the vehicle safety compliance-testing program shall be released to anyone except the COTR, unless specifically authorized by the COTR or the COTR's Branch or Division Chief.

NO INDIVIDUALS, OTHER THAN CONTRACTOR PERSONNEL DIRECTLY INVOLVED IN THE COMPLIANCE TESTING PROGRAM, SHALL BE ALLOWED TO WITNESS ANY VEHICLE COMPLIANCE TEST UNLESS SPECIFICALLY AUTHORIZED BY THE COTR.

4. GOOD HOUSEKEEPING

Contractors shall maintain the entire vehicle compliance testing area, test fixtures and instrumentation in a neat, clean and painted condition with test instruments arranged in an orderly manner consistent with good test laboratory housekeeping practices.

5. TEST SCHEDULING AND MONITORING

The contractor shall submit a test schedule to the COTR prior to testing. Tests shall be completed as required in the contract. Scheduling shall be adjusted to permit sample motor vehicles to be tested to other FMVSS as may be required by the OVSC. All testing shall be coordinated to allow monitoring by the COTR.

6. TEST DATA DISPOSITION

The contractor shall make all preliminary compliance test data available to the COTR on location within four hours after the test. Final test data, including digital printouts and computer generated plots (if applicable), shall be furnished to the COTR within five working days. Additionally, the contractor shall analyze the preliminary test results as directed by the COTR.

All backup data tapes and sheets, plots, technicians notes, etc., shall be either sent to the COTR or destroyed at the conclusion of each delivery order, purchase order, etc.

7. GOVERNMENT FURNISHED PROPERTY (GFP)

TEST VEHICLES

The Contractor has the responsibility of accepting test vehicles from either new car dealers or vehicle transporters. In both instances, the contractor acts in the OVSC's behalf when signing an acceptance of test vehicles. If a vehicle is delivered by a dealer, the contractor must check to verify the following:

- A. All options listed on the "window sticker" are present on the test vehicle.
- B. Tires and wheel rims are the same as listed.
- C. There are no dents or other interior or exterior flaws.
- D. The vehicle has been properly prepared and is in running condition.
- E. The glove box contains an owner's manual, warranty document, consumer information, and extra set of keys.
- F. Proper fuel filler cap is supplied on the test vehicle.

If the test vehicle is delivered by a government-contracted transporter, the contractor should check for damage, which may have occurred during transit.

A "Vehicle Condition" form (shown on the next page) will be supplied to the contractor by the COTR when the test vehicle is transferred from the new car dealer or between test contracts. The upper half of the form describes the vehicle in detail, and the lower half provides space for a detailed description of the posttest condition. Vehicle Condition forms must be returned to the COTR with the copies of the Final Test Report or the reports will NOT be accepted.

NOTIFICATION OF COTR

The COTR must be notified within 24 hours after a vehicle has been delivered.

REPORT OF VEHICLE CONDITION AT THE COMPLETION OF TESTING....Continued

REMARKS:

Equipment that is no longer on the test vehicle as noted on previous page:

Explanation for equipment removal:

Test Vehicle Condition:

RECORDED BY: _____

DATE: _____

APPROVED BY: _____

8. CALIBRATION OF TEST INSTRUMENTS

Before the contractor initiates the safety compliance test program, a test instrumentation calibration system will be implemented and maintained in accordance with established calibration practices. Guidelines for setting up and maintaining such calibration systems are described in MIL-C-45662A, "Calibration System Requirements." The calibration system shall be set up and maintained as follows:

- A. Standards for calibrating the measuring and test equipment will be stored and used under appropriate environmental conditions to assure their accuracy and stability.
- B. All measuring instruments and standards shall be calibrated by the contractor, or a commercial facility, against a higher order standard at periodic intervals NOT TO EXCEED TWELVE (12) MONTHS! Records, showing the calibration traceability to the National Institute of Standards and Technology (NIST), shall be maintained for all measuring and test equipment.
- C. All measuring and test equipment and measuring standards will be labeled with the following information:
 - (1) Date of calibration
 - (2) Date of next scheduled calibration
 - (3) Name of the technician who calibrated the equipment
- D. A written calibration procedure shall be provided by the contractor which includes as a minimum the following information for all measurement and test equipment:
 - (1) Type of equipment, manufacturer, model number, etc.
 - (2) Measurement range
 - (3) Accuracy
 - (4) Calibration interval
 - (5) Type of standard used to calibrate the equipment (calibration traceability of the standard must be evident)
- E. Records of calibration for all test instrumentation shall be kept by the contractor in a manner, which assures the maintenance of established calibration schedules. All such records shall be readily available for inspection when requested by the COTR. The calibration system will need the acceptance of the COTR before the test program commences.
- F. Both at the beginning and end of each test day, a calibration check shall be made and recorded for the records of the test being performed.

9. PHOTOGRAPHIC DOCUMENTATION

Photographs shall be black and white, 8-1/2 x 11 inches, and legible. A tag, label or placard identifying the test vehicle model as well as the NHTSA number, if applicable, shall appear in each photograph and be legible. The test vehicle shall show the compliance test date. Each photograph shall be labeled as to subject matter. As a minimum the following photographs shall be included:

- A. 3/4 frontal view from left side of vehicle (at GVWR)
- B. 3/4 rear view from right side of vehicle (at GVWR)
- C. Vehicle's certification label
- D. Vehicle's tire information label (if not part of certification label)
- E. Thermocouple installation of left front and right rear (with wheels and or drums removed)
- F. Test instrumentation in vehicle
- G. Test track dimensioned layout (may be a scaled drawing).
- H. Photos of all test instrumentation used in conducting this test with full description; may be a composite photo taken with instrumentation removed from vehicle.
- I. Spike stop applier as installed in the vehicle.
- J. Vehicle being weighed and location(s) of ballast in vehicle.
- K. Brake system indicator lamps, when activated under the condition(s) specified in test procedure section 15.19.3.1 (S5.3.1).
- L. Brake fluid reservoir label as defined in test procedure section 15.19.2.2 (S5.4.3).
- M. Close up of any failures.

10. DEFINITIONS

ANTILOCK SYSTEM

A portion of a service brake system that automatically controls the degree of rotational wheel slip at one or more road wheels of the vehicle during braking.

BACKUP SYSTEM

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

BRAKE POWER ASSIST UNIT

A device installed in a hydraulic brake system that reduces the operator effort required to actuate the system and if inoperative, does not prevent the operator from braking the vehicle by a continued application of muscular force on the service brake control.

BRAKE POWER UNIT

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 the operator action consisting only of modulating the energy application level.

HYDRAULIC BRAKE SYSTEM

A system that uses hydraulic fluid as a medium for transmitting force from a service brake control to the service brake. The system may incorporate a brake power assist unit or a brake power unit.

INCIPIENT SKID

Point where an increase in pedal force would cause one or more wheels to be completely locked up.

INITIAL BRAKE TEMPERATURE

The average temperature of the service brakes on the hottest axle of the vehicle 0.2 mile before any brake application.

INTERVAL

Distance from start of one stop to the start of the following stop.

10. DEFINITIONS....Continued

LIGHTLY LOADED VEHICLE WEIGHT (LLVW)

For vehicles with a **GVWR of 10,000 pounds or less** - Unloaded Vehicle Weight (UVW) plus 400 pounds (including driver and instrumentation).

For vehicles with a **GVWR greater than 10,000 pounds** - Unloaded Vehicle Weight (UVW) plus 500 pounds (including driver and instrumentation).

MAXIMUM TEST SPEED

That speed which is a multiple of 5 mph and which is 4 to 8 mph less than the speed attainable in 2 miles. If the attainable speed is 104 mph or greater the maximum test speed is 100 mph.

NORMAL DRIVING GEAR

Transmission range that allows lowest engine rpm for a particular vehicle speed (for small-engine vehicles for those equipped with overdrive, request special guidance from the Office of Vehicle Safety Compliance (OVSC)).

PARKING BRAKE

A friction-type, mechanically engaged device designed to prevent the movement of a stationary motor vehicle.

PARKING MECHANISM

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 enabling the ignition key to be removed.

PRESSURE COMPONENT

A brake system component that contains the brake system fluid and controls or senses the fluid pressure.

RESPONSE TIME

The time increment from the first application of force to the service brake pedal until the first point at which the deceleration is level with the average sustained value.

10. DEFINITIONS....Continued

SKID NUMBER

The frictional resistance of a pavement measured in accordance with American Society for Testing and Materials Method E-274-85 (as revised May 1985) at 40 mph, omitting water delivery as specified in Paragraphs 8.1 and 8.2 of that method.

SNUB

The braking deceleration of a vehicle from a higher reference speed to a lower reference speed that is greater than zero.

SPEED ATTAINABLE IN 2 MILES

The speed attainable by accelerating at maximum rate from a standing start for 2 miles on a level surface.

SPIKE STOP

A stop resulting from the application of 200 pounds of force on the service brake control in 0.08 seconds.

SPLIT SERVICE BRAKE SYSTEM

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

STOPPING DISTANCE

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

UNLOADED VEHICLE WEIGHT (UVW)

Actual weight of test vehicle with maximum capacity of engine fuel, oil, and coolant.

VARIABLE PROPORTIONING BRAKE SYSTEM

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.

WHEEL LOCKUP

Wheel slip of 95 percent or wheel rotation rate equivalent to 5 percent of vehicle velocity.

11. TEST EQUIPMENT AND REFERENCES

The following test equipment shall be used:

- A. Fifth wheel to measure vehicle velocity, 150 fps range with accuracy of ± 0.7 fps at 88 fps, maximum non-linearity of ± 1.5 fps over the range and visual output resolution of 0.15 fps.
- B. 140-tooth gear magnetic pickup or equivalent to measure stopping distance, 10^5 feet range with accuracy of + 10 feet in 1,000 feet, maximum non-linearity of ± 20 feet, per 2,000 feet increment, and visual output resolution of 0.1 foot.
- C. Two load cells to measure normal pedal force on service brake and parking brake, (perpendicular to pedal face), 300 pound range with accuracy of ± 1.5 pounds at 150 pounds, maximum non-linearity of + 3 pounds over the range, and visual output resolution of 1.5 pounds.
- D. Iron-constantan thermocouple, plug type. Maximum wire resistance variation $\pm 10\%$ pyrometer calibrated value for non-compensated pyrometers.
- E. Friction material temperature instrumentation (pyrometer) to measure brake lining temperatures, $1,200^\circ\text{F}$ range with $\pm 10^\circ\text{F}$ accuracy at 300°F , maximum non-linearity of $\pm 20^\circ\text{F}$ over the range and visual output resolution of 5°F .
- F. Decelerometer to measure vehicle deceleration rate, 1G range with ± 0.5 fpsps accuracy at 32.2 fpsps, maximum non-linearity of ± 0.5 fpsps over the range, and visual output resolution of 0.5 fpsps.
- G. Ambient temperature gauge to record ambient test temperatures, 32°F to 100°F range with $\pm 0.5^\circ\text{F}$ accuracy at 70°F , maximum non-linearity $\pm 1.0^\circ\text{F}$ over the range, and visual output resolution of 1°F .
- H. Stopwatch to measure elapsed time during certain tests, 15 minute range with accuracy ± 0.5 second in 60 seconds, maximum non-linearity of 1.5 seconds over the range, and visual output resolution of 0.1 second.
- I. Anemometer to measure wind velocity. Twenty-five (25) mph range with ± 1 mph accuracy at 15 mph, maximum non-linearity of ± 2 mph over the range and visual output resolution of 1 mph.
- J. Ballast to simulate passenger, cargo, etc. Ballast with a density of 50 to 450 lb/ft^3 is used in the seating area of all vehicles, as well as the cargo areas of vehicles with a GVWR of 10,000 pounds or less. Ballast with a density of 400 to 725 lb/ft^3 shall be used in the cargo area of vehicles with a GVWR, which exceeds 10,000 pounds

11. TEST EQUIPMENT AND REFERENCES...Continued

- K. Wheel lockup detector providing an electrical indication of wheel rotation (or wheel lockup) to a continuous recorder or digital data recorder with data acquisition software. The lockup detector system must provide a visual indication for wheels that lockup above 10 mph, + 1 mph, - 0 mph and remain on until the system is reset.

The reset circuitry must have the capability of resetting the visual indicators while the vehicle speed is above 10 mph. The system must also have the capability of recording, either on a strip chart or digital acquisition graph, any combination of wheel lockup, and show which wheel or wheels locked up at speeds above 10 mph.

- L. A continuous recorder, i.e., an oscillograph or computer utilizing a digital data acquisition system, to make a permanent, supplemental record of service brake pedal force, parking brake force, deceleration, lockup, distance and speed versus time, with the same accuracies as the above direct reading instrumentation or as otherwise indicated.
- M. Manufacturer's shop manual.
- N. An application device shall be used for the spike stops, which meets the application rate requirement of that test.
- O. A moving barrier, as described in Paragraph 3.3 of SAE Recommended Practice J972, "Moving Barrier Collision Tests," November 1966, is required for the Optional Parking Brake Test Procedure on vehicles with a transmission, which incorporates a parking brake mechanism.
Paragraph 3.3 of SAE J972 lists the following barrier characteristics:

- (1) The barrier shall be of very rigid construction.
- (2) Its total weight shall be 4,000 pounds (however, allowable tolerance for this test shall be +0 pounds, -50 pounds).
- (3) The flat face of the barrier shall be 2 feet 6 inches high, 8 feet wide, and have a 7 inch, \pm 1 inch, ground clearance. The face of the barrier shall be covered with 0.750-inch thick plywood.
- (4) The chassis upon which the moving barrier is mounted shall have a remote or inertia controlled braking device capable of stopping it.

The barrier design must be approved by the NHTSA COTR prior to being used.

12. PRETEST REQUIREMENTS

Prior to conducting any compliance tests, contractors are required to submit a detailed in-house compliance test procedure and equipment list to the COTR, which includes a step-by-step description of the methodology to be used and a detailed check-off list. Written approval must be obtained from the COTR before commencing testing so that all parties are in agreement.

The contractor's test procedure shall contain a complete listing of test equipment and a detailed check-off list. There shall be no contradiction between the OVSC Laboratory Test Procedure and the contractor's in-house test procedure. The list of test equipment shall include instrument accuracy and calibration dates.

TEST DATA LOSS

A compliance test is not to be conducted unless all of the various test conditions specified in the applicable OVSC Laboratory Test Procedure have been met. Failure of a contractor to obtain the required test data and to maintain acceptable limits on test parameters in the manner outlined in the applicable OVSC Laboratory Test Procedure may require a retest at the expense of the contractor. The retest costs will include the cost of the replacement vehicle (with the same equipment as the original vehicle) or item of motor vehicle equipment and all costs associated with conducting the retest. The original test specimen (vehicle or equipment item) used for the invalid test shall remain the property of OVSC, and the retest specimen shall remain the property of the contractor. If there is a test failure, the contractor shall retain the retest specimen for a period not exceeding 180 days. If there is no test failure, the Contractor may dispose of the test specimen upon notification from the COTR that the final test report has been accepted.

The Contracting Officer of NHTSA is the only NHTSA official authorized to notify the contractor that a retest is required. The retest shall be completed within two (2) weeks after receipt of notification by the Contracting Officer that a retest is required. If a retest is conducted, no test report is required for the original test.

13. GENERAL TEST CONDITIONS

- A. A clean, dry surface shall be employed and the skid numbers shall be between 76 and 86 as determined by ASTM E-274-85 (as revised May 1985) at 40 mph, omitting water delivery as specified in Paragraphs 8.1 and 8.2 of that method.
- B. The road shall be flat within ± 1 percent grade in all directions (including crown).
- C. The road shall be under exclusive control of contractor at time of test.
- D. Twelve-foot (12') lanes shall be clearly marked.
- E. Markers designating required intervals between stops for fade stops shall be provided.
- F. Travel to and from the test roads shall be minimal and entail only moderate braking. Dusty or muddy road surfaces shall be avoided.
- G. The two parking brake test ramps shall have a clean, dry, and smooth Portland Cement concrete surface. The ramp shall have a grade of 29 to 30 percent. The second shall have a grade of 19 to 20 percent.
- H. The fuel tank shall be 75 to 100 percent full during the test.
- I. All tire pressures shall be set cold according to the manufacturer's instructions for the GVWR at the beginning of each workday and recorded on the data sheets.
- J. All phases for which there are performance requirements shall be run with ambient air temperature between 32°F and 100°F.
- K. Under no circumstances shall tests be conducted with the wind velocity exceeding 15 mph. Tests shall not be conducted either into or with winds exceeding 10 mph whose directions are within 45 degrees (left or right - front and rear) of the vehicle's longitudinal centerline.
- L. Verify the calibration of all instrumentation at the start and end of each test day using a written procedure approved for the instrumentation. If failure is indicated on any test, immediately recheck the calibration of all instrumentation after the COTR has been notified. Document results for inclusion in final report as above.

13. GENERAL TEST CONDITIONS....Continued

- M. Unless otherwise specified, the force applied to a brake control is not to be less than 15 pounds and not more than 150 pounds. If a 150-pound force does not achieve the required deceleration, record the deceleration rate at 150 pounds pedal force.
- N. Immediately prior to every stop, except for burnishing, fade, recovery, and spike stops, the vehicle must be in the center of a 12-foot wide lane. Other than spike stops, the vehicle must remain in the roadway to meet the requirements of this test procedure.
- O. With the exception of spike stops (but not spike check stops), partial failure stops, and inoperative brake power or power assist unit stops, all stops are made without lockup of more than one wheel at speeds greater than 10 mph. Controlled lockup on an antilock-equipped axle is permitted, and lockup of not more than one wheel per vehicle, uncontrolled by the antilock system, is allowed as above.
- P. The test driver will exercise best effort to make the test stops within the prescribed parameters as indicated in Tables 1 through 6. The vehicle speed shall be within + 0 mph and - 1 mph of the required speed for test stops. In the effectiveness (stopping distance) tests, achieve a deceleration as quickly as possible that will bring one or more of the vehicle's wheels to an incipient skid condition without locking up more than one wheel. Attempt to avoid repeated lock-up of the same wheel or sustaining a locked wheel throughout a high-speed stop. Stops made with more than one wheel locked, at speeds over 10 mph, for full brake system effectiveness tests, and are not acceptable to demonstrate compliance with S105 requirements. However, such stops do count as attempts for a particular test sequence.

If, on the first two stops of a test sequence, the driver is unable to achieve a passing stop (i.e., first stop resulted in lock-up of two wheels over 10 mph and second stop resulted in exceeding the required stopping distance), consult the NHTSA COTR for guidance on the remaining stops. For stops where the criterion is deceleration (i.e., fade and recovery), the average deceleration of the vehicle shall be within +0 fpsps and -1 fpsps.

13. GENERAL TEST CONDITIONS....Continued

TABLE 1

Stopping Performance Guidelines for Passenger Cars

Test	30 mph		60 mph		80 mph	
	Target Decel. (fpsps)	Target Stopping Distance (feet)	Target Decel. (fpsps)	Target Stopping Distance (feet)	Target Decel. (fpsps)	Target Stopping Distance (feet)
1st Effectiveness	24	51	23	194	NA	NA
2nd Effectiveness	26	48	24	183	22	344
3rd Effectiveness	NA	NA	26	174	NA	NA
Partial Failure, Failed Antilock or Variable Prop. Valve	NA	NA	10	410	NA	NA
Inoperative Power Assist	NA	NA	10	410	NA	NA
4th Effectiveness	24	51	23	194	21	364
Post-Spike Effectiveness	NA	NA	23	194	NA	NA

The target stopping distances shown in the table are 90 percent of those allowed by FMVSS 105-83. The target deceleration rates were computed using a 0.5 second rise time to the specified deceleration rate, rounded off to the nearest whole fpsps.

13. GENERAL TEST CONDITIONS....Continued

TABLE 2

**Stopping Performance Guidelines for Vehicles with GVWR of Less Than 8,000 lb
(Other Than Passenger Cars and School Buses)**

Test	30 mph		60 mph	
	Target Decel. (fpsps)	Target Stopping Distance (feet)	Target Decel. (fpsps)	Target Stopping Distance (feet)
1st Effectiveness	21	58	20	218
2nd Effectiveness	24	51	23	194
3rd Effectiveness	NA	NA	23	194
Partial Failure, Failed Antilock or Variable Prop. Valve	NA	NA	9	465
Inoperative Power Assist	NA	NA	9	465
4th Effectiveness	21	58	20	218
Post-Spike Effectiveness	NA	NA	20	218

The target stopping distances shown in the table are 90 percent of those allowed by FMVSS 105-83. The target deceleration rates were computed using a 0.5 second rise time to the specified deceleration rate, rounded off to the nearest whole fpsps.

13. GENERAL TEST CONDITIONS....Continued

TABLE 3
Stopping Performance Guidelines for Vehicles with GVWR of 8,000 to 10,000 lb
(Other Than School Buses)

Test	30 mph		60 mph	
	Target Decel. (fpsps)	Target Stopping Distance (feet)	Target Decel. (fpsps)	Target Stopping Distance (feet)
1st Effectiveness	19	62	18	240
2nd Effectiveness	24	51	23	194
3rd Effectiveness	NA	NA	NA	NA
Partial Failure, Failed Antilock or Variable Prop. Valve	NA	NA	9	465
Inoperative Power Assist	NA	NA	9	465
4th Effectiveness	21	58	18	240
Post-Spike Effectiveness	NA	NA	18	240

The target stopping distances shown in the table are 90 percent of those allowed by FMVSS 105-83. The target deceleration rates were computed using a 0.5 second rise time to the specified deceleration rate, rounded off to the nearest whole fpsps.

TABLE 4
Stopping Performance Guidelines for Vehicles with GVWR Greater Than 10,000 lb
(Other Than School Buses)

Test	60 mph	
	Target Decel. (fpsps)	Target Stopping Distance (feet)
Partial Failure, Failed Antilock or Variable Prop. Valve	7	552
Inoperative Power Assist	7	552

The target stopping distances shown in the table are 90 percent of those allowed by FMVSS 105-83. The target deceleration rates were computed using a 0.5 second rise time to the specified deceleration rate, rounded off to the nearest whole fpsps.

13. GENERAL TEST CONDITIONS....Continued

TABLE 5
Stopping Performance Guidelines for School Buses
with GVWR of 10,000 lb or Less

Test	30 mph		60 mph	
	Target Decel. (fpsps)	Target Stopping Distance (feet)	Target Decel. (fpsps)	Target Stopping Distance (feet)
1st Effectiveness	19	62	18	240
2nd Effectiveness	24	51	23	194
3rd Effectiveness	NA	NA	20	218
Partial Failure, Failed Antilock or Variable Prop. Valve	NA	NA	9	465
Inoperative Power Assist	NA	NA	9	465
4th Effectiveness	21	58	18	240
Post-Spike Effectiveness	NA	NA	18	240

The target stopping distances shown in the table are 90 percent of those allowed by FMVSS 105-83. The target deceleration rates were computed using a 0.5 second rise time to the specified deceleration rate, rounded off to the nearest whole fpsps.

13. GENERAL TEST CONDITIONS....Continued

TABLE 6

**Stopping Performance Guidelines for School Buses
with GVWR Greater Than 10,000 lb**

Test	30 mph		60 mph	
	Target Decel. (fpsps)	Target Stopping Distance (feet)	Target Decel. (fpsps)	Target Stopping Distance (feet)
1st Effectiveness	14	79	12	349
2nd Effectiveness	16	73	12	349
3rd Effectiveness	NA	NA	12	349
Partial Failure, Failed Antilock or Variable Prop. Valve	NA	NA	7	552
Inoperative Power Assist	NA	NA	7	552

The target stopping distances shown in the table are 90 percent of those allowed by FMVSS 105-83. The target deceleration rates were computed using a 0.5 second rise time to the specified deceleration rate, rounded off to the nearest whole fpsps.

- Q. The initial brake temperature shall be 150°F to 200°F unless otherwise specified.
- R. If the initial brake temperature for the first stop in a test procedure has not been reached, heat the brakes to the initial brake temperature by making not more than 10 snubs from 40 mph to 10 mph, at a deceleration not greater than 10 fpsps.
- S. All required deceleration rates shall be achieved within 0.5 second or as otherwise specified.
- T. The transmission selector control shall be in neutral for all decelerations in effectiveness tests and spike stops. The control shall also be in neutral on fade and recovery snubs for vehicles greater than 10,000 pounds GVWR. For all other tests during all decelerations, the transmission selector is in the control position, other than overdrive, 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 decreases to 20 mph.

13. GENERAL TEST CONDITIONS....Continued

When the transmission selector control is required to be in neutral for a deceleration, a stop or snub shall be obtained by exceeding the test speed by 4 to 8 mph, closing the throttle and coasting in gear to approximately 2 mph above the test speed, shifting to neutral, and when the test speed is reached, applying the service brakes.

- U. All vehicle openings (doors, windows, hood, trunk, convertible top, cargo doors, etc.) are closed except as required for instrumentation purposes.
- V. For all spike stops the force is to be applied in accordance with the requirements of Figure 1.
- W. Data is to be furnished in every data blank provided on the report forms, or if not applicable, insert "NA," indicating otherwise on the same form the vehicle related reason or relationship, which applies. Corrections are to be made by drawing a line through the data, leaving it legible and adding the corrected entry, initials, and date.
- X. Record any unusual brake performance, such as pull, noise, smoke, wrap-up, or skid that occurs during the testing.
- Y. Every sheet of any document relating to a test, including automatic continuous recorder data, will contain the NHTSA number of the vehicle and positive identification of its relation to the test and an applicable signature.
- Z. For vehicles manufactured on or after September 1, 1991, the automatic adjusters must remain active at all times. For vehicles manufactured before September 1, 1991, automatic adjusters may be locked out at the option of the manufacturer. If locked out they must remain locked out for the entire sequence of tests.

13. GENERAL TEST CONDITIONS....Continued

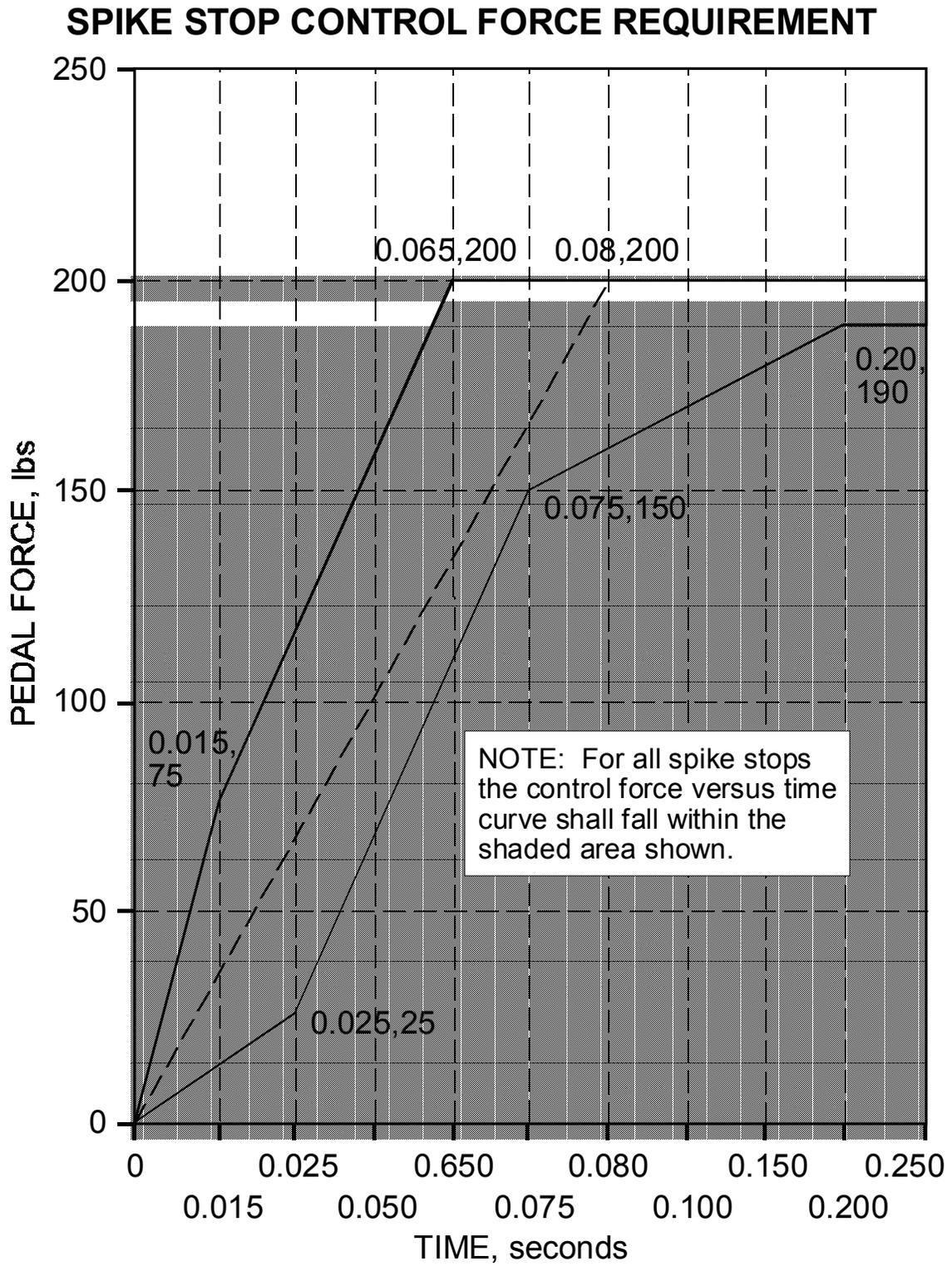


FIGURE 1

14. VEHICLE PREPARATION

- A. Weigh and record unloaded vehicle weight by axle. Vehicle should have maximum capacity of engine fuel, oil, and coolant. Note: the vehicle wheel or axle being weighed shall be within ± 1 percent level with respect to other wheels or axles during all weighing. Determine and record target axle weight for GVWR.
- B. Install plug-type thermocouples in the approximate center of the facing length and width of the most heavily loaded shoe or disc pad, one per brake, as shown in Figure 2. Install a second thermocouple within one inch of the first to be used if the lining wear reaches a point causing the first thermocouple to contact the metal rubbing surface of a drum or rotor. Exception: if the vehicle's hydraulic split is such that the most heavily loaded shoe or disc pad will not be applied during partial failure testing, install the second thermocouple in the other shoe or pad at 0.080 inch depth and connect it during the appropriate partial failure test. For center-grooved shoes or pads, thermocouples are installed within 1/8-inch to 1/4-inch of the groove and as close to the center as possible. In all cases, install thermocouples with minimum disassembly or adjustment of the brakes. If original adjustment is disturbed, it should be reset to the manufacturer's specification. Inspect friction material and drum or disc for any abnormalities or wear, and photograph if present. Non-service brake frictional surfaces shall have thermocouples installed in addition to service brakes.
- C. Install instrumentation. Determine actual LLVW with test personnel and instrumentation. Distribute weight in front passenger seat area. Ballast to achieve axle load not less than axle load at unloaded vehicle weight. Record this weight by axle.
- D. Check brake fluid reservoirs for proper amount of fluid. Note any deficiency in amount or condition in fluid.
- E. Set tire pressure according to manufacturer's specification for the vehicle at GVWR.
- F. Load vehicle to GVWR with axle loads proportional to GAWR. If the weight on any axle of a vehicle at lightly loaded weight determined in item C, exceeds that axle's **proportionate** share of the gross vehicle weight rating, the load required to reach GVWR is placed so that the vehicle weight on that axle is not less than the lightly loaded vehicle weight. All ballast shall be placed within vehicle seating areas in foot well, and if necessary, in seats, and cargo areas. Record weight by axle.

14. VEHICLE PREPARATION....Continued

- G. Secure all equipment and ballast.
- H. Make stops in accordance with manufacturer's recommendations to adjust brakes, if applicable.
- I. Proceed with the test schedule in the order shown.

NOTE: The second thermocouple shall be installed at 0.080-inch depth within 1 inch circumferentially of the thermocouple installed at 0.040-inch depth

14. VEHICLE PREPARATION...Continued

TYPICAL PLUG TYPE THERMOCOUPLE INSTALLATION

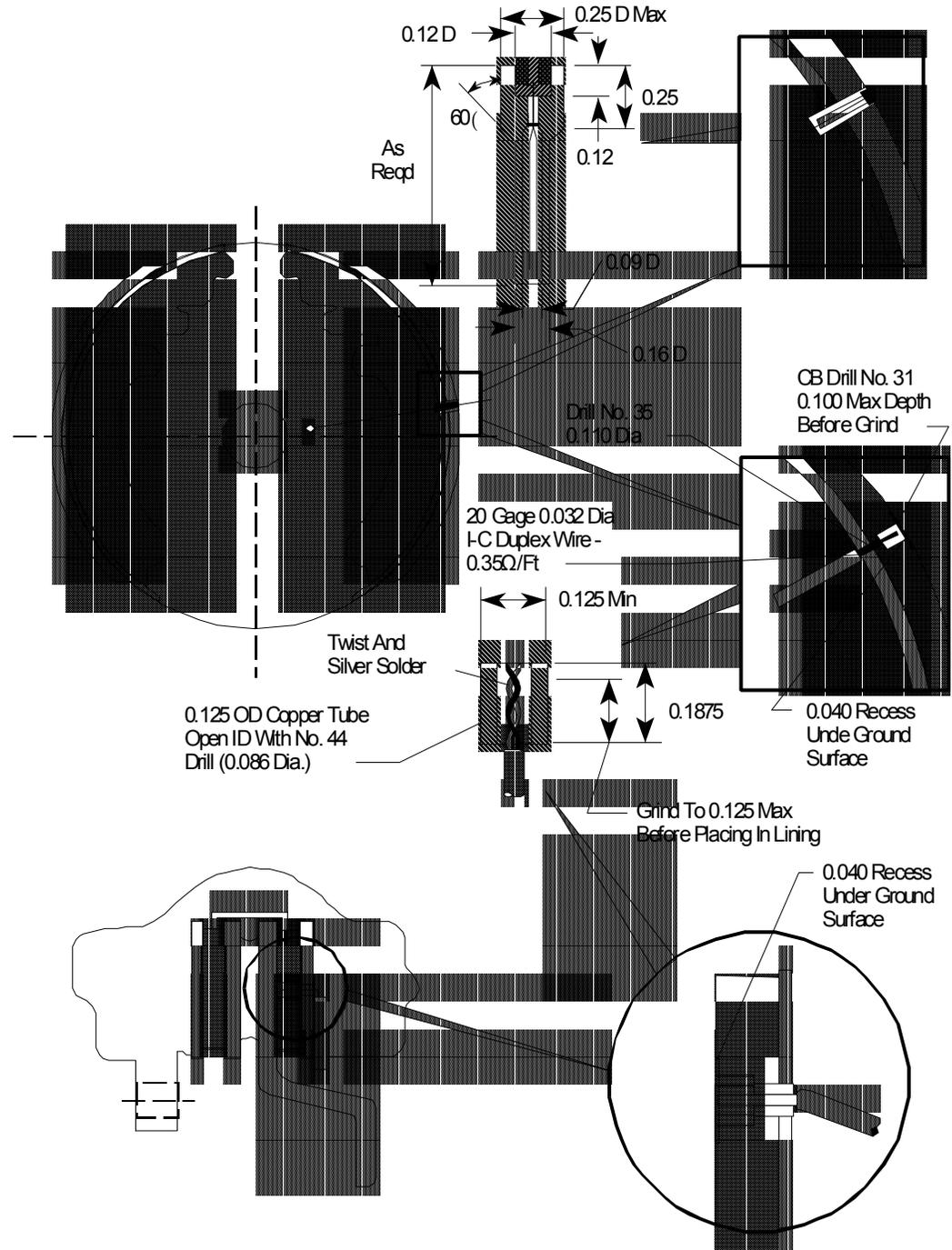


FIGURE 2

15. COMPLIANCE TEST EXECUTION

Testing will be accomplished as indicated in this section except as otherwise directed. See Table 7 to determine the tests, which must be conducted for the following vehicle categories.

- A. Passenger cars
- B. Multipurpose passenger vehicles (MPV), trucks, and buses (other than school buses (gross weight less than 8,000 pounds)
- C. MPVs, trucks, and buses (other than school buses) (gross weight between 8,000 and 10,000 pounds)
- D. MPVs, trucks, and buses (other than school buses) (gross weight more than 10,000 pounds)
- E. School buses (gross weight 10,000 pounds or less)
- F. School buses (gross weight more than 10,000 pounds)

15. COMPLIANCE TEST EXECUTION....Continued

TABLE 7

Brake Test Sequence and Vehicle Category Applicability

SEQUENCE	PASS. CAR	MPV, BUS, TRUCK (<8K)	MPV, BUS, TRUCK (8K-10K)	SCHOOL BUSES (<10K)	MPV, BUS, TRUCK (>10K)	SCHOOL BUSES (>10K)
Speed Determination	X	X	X	X	X	X
1st Effectiveness	X	X	X	X		X
Burnish	X	X	X	X	X	X
2nd Effectiveness	X	X	X	X		X
1st Reburnish	X	X	X	X	X	X
Parking Brake	X	X	X	X		X
3rd Effectiveness	X	X		X		X
Partial Failure	X	X	X	X	X	X
Inoperative Brake Power, Power Assist	X	X	X	X	X	X
1st Fade and Recovery	X	X	X	X		X
2nd Reburnish	X	X	X	X		X
2nd Fade and Recovery	X	X	X	X		X
3rd Reburnish	X	X	X	X		X
4th Effectiveness	X	X	X	X		
Water Recovery	X	X	X	X		X
Spike Stops	X	X	X	X		
Final Inspection	X	X	X	X	X	X

15.1 SPEED DETERMINATION

FOR PASSENGER CARS, record the speed, which the vehicle will attain in a distance of two miles from a standing start (104 mph need not be exceeded). If this speed is less than 60 mph, tests specified to commence at that speed shall be commenced at the multiple of 5 mph that is 4 to 8 mph less than the speed measured above, using the corresponding stopping distances shown below in Table 8. If this speed is 60 mph or greater, tests specified in Table 7 shall use the corresponding stopping distances in Appendix 2.

15. COMPLIANCE TEST EXECUTION....Continued

TABLE 8

**Stopping Distance in Feet for Test Indicated
Passenger Cars**

Speed	1st Effect. 4th Effect. Spike Effect.	2nd Effect.	3rd Effect.	Partial Fail. Inoperative Power Assist
35 mph	74	70	67	155
40 mph	96	91	87	202
45 mph	121	115	110	257
50 mph	150	142	135	317
55 mph	181	172	163	383

FOR VEHICLES OTHER THAN PASSENGER CARS WITH A GVWR LESS THEN 8,000 POUNDS, record the speed, which the vehicle will attain in a distance of two miles from a standing start (84 mph need not be exceeded). If this speed is less than 60 mph, tests specified to commence at that speed shall be commenced at the multiple of 5 mph that is 4 to 8 mph less than the speed measured above, using the corresponding stopping distances shown below in Table 9. If this speed is 60 mph or greater, tests specified in Table 7 shall use the corresponding stopping distances in Appendix 2.

TABLE 9

**Stopping Distance in Feet for Test Indicated
Vehicles other than Passenger Cars with GVWR less than 8,000 lb**

Speed	1st Effect. 4th Effect. Spike Effect.	2nd Effect.	3rd Effect.	Partial Fail. Inoperative Power Assist
35 mph	83	74	74	176
40 mph	108	96	96	359
45 mph	137	121	121	291
50 mph	169	150	150	359
55 mph	204	181	181	433

15. COMPLIANCE TEST EXECUTION....Continued

FOR VEHICLES WITH A GVWR OF 8,000 TO 10,000 POUNDS, OTHER THAN SCHOOL BUSES, record the speed, which the vehicle will attain in a distance of two miles from a standing start (84 mph need not be exceeded). If this speed is less than 60 mph, tests specified to commence at that speed shall be commenced at the multiple of 5 mph that is 4 to 8 mph less than the speed measured above, using the corresponding stopping distances shown below in Table 10. If this speed is 60 mph or greater, tests specified in Table 7 shall use the corresponding stopping distances in Appendix 2.

TABLE 10

**Stopping Distance in Feet for Test Indicated
Vehicles with GVWR of 8,000 to 10,000 pounds
Other than School Buses**

Speed	1st Effect. 4th Effect. Spike Effect.	2nd Effect.	3rd Effect.	Partial Fail. Inoperative Power Assist
35 mph	91	74	83	176
40 mph	119	96	108	229
45 mph	150	121	137	291
50 mph	185	150	169	359
55 mph	224	181	204	433

FOR VEHICLES WITH A GVWR GREATER THAN 10,000 POUNDS, OTHER THAN SCHOOL BUSES, record the speed, which the vehicle will attain in a distance of 2 miles from a standing start (64 mph need not be exceeded). If this speed is less than 60 mph, tests specified to commence at that speed shall be commenced at the multiple of 5 mph that is 4 to 8 mph less than the speed measured above, using the corresponding stopping distances shown in Table 11. If this speed is 60 mph or greater, tests specified in Table 7 shall use the corresponding stopping distances in Appendix 2.

15. COMPLIANCE TEST EXECUTION....Continued

TABLE 11

**Stopping Distance in Feet for Test Indicated
Vehicles with GVWR greater than 10,000 pounds
Other than School Buses**

Speed	Effectiveness Tests	Partial Failure Power Loss
35 mph	132	225
40 mph	173	288
45 mph	218	358
50 mph	264	435
55 mph	326	530

FOR SCHOOL BUSES WITH GVWR OF 10,000 POUNDS OR LESS, record the speed, which the vehicle will attain in a distance of two miles from a standing start (84 mph need not be exceeded). If this speed is less than 60 mph, tests specified to commence at that speed shall be commenced at the multiple of 5 mph that is 4 to 8 mph less than the speed measured above, using the corresponding stopping distances shown in Table 12. If this speed is 60 mph or greater, tests specified in Table 7 shall use the corresponding stopping distances in Appendix 2.

TABLE 12

**Stopping Distance in Feet for Test Indicated
School Buses with GVWR of 10,000 pounds or Less
(Less than 8,000 pounds/8,000 to 10,000 pounds)**

Speed	1st Effect. 4th Effect. Spike Effect.	2nd Effect.	3rd Effect.	Partial Fail. Inoperative Power Assist
35 mph	83/91	74	74/83	176
40 mph	108/119	96	96/108	229
45 mph	137/150	121	121/137	291
50 mph	169/185	150	150/169	359
55 mph	204/224	181	181/204	433

15. COMPLIANCE TEST EXECUTION....Continued

FOR SCHOOL BUSES WITH A GVWR GREATER THAN 10,000 POUNDS, record the speed, which the vehicle will attain in a distance of 2 miles from a standing start (64 mph need not be exceeded). If this speed is less than 60 mph, tests specified to commence at that speed shall be commenced at the multiple of 5 mph that is 4 to 8 mph less than the speed measured above, using the corresponding stopping distances shown in Table 13. If this speed is 60 mph or greater, tests specified in Table 7 shall use the corresponding stopping distances in Appendix 2.

TABLE 13
Stopping Distance in Feet for Test Indicated
School Buses with GVWR greater than 10,000 pounds

Speed	Effectiveness Tests	Partial Failure Power Loss
35 mph	132	225
40 mph	173	288
45 mph	218	358
50 mph	264	435
55 mph	326	530

15.2 BRAKE WARMING

Heat the brakes to not less than 150°F and not more than 200°F (unless otherwise specified) by making not more than 10 snubs from not more than 40 mph to 10 mph at a deceleration rate not greater than 10 fpsps.

15.3 INSTRUMENTATION CHECK

Check the instrumentation by making not more than 10 stops from a speed of not more than 30 mph, or ten snubs from not more than 40 mph to 10 mph, at a deceleration rate of not more than 10 fpsps. If instrument repair, replacement, or adjustment is necessary, make not more than 10 additional stops or snubs after the correction.

15.4 FIRST EFFECTIVENESS TEST (PREBURNISH) (S7.3) (Applies to vehicles with a GVWR of 10,000 pounds or less and school buses.)

Make 6 stops from 30 mph and 6 stops from 60 mph. Record the stopping distances.

15. COMPLIANCE TEST EXECUTION....Continued**15.5 BURNISH PROCEDURE (S7.4)****A. Burnish - vehicles with GVWR of 10,000 pounds or less**

Burnish the brakes by making 200 stops from 40 mph at 12 fpsps: stops after the first shall not be commenced until either the vehicle has run one mile from the start of the previous stop, or the brake temperature has dropped to between 230°F and 270°F. Speed should not exceed 40 mph between stops. (The 150-pound limit on control force does not apply.)

After burnishing, adjust the brakes in accordance with the manufacturer's published recommendations.

B. Burnish - vehicles with a GVWR greater than 10,000 pounds and manufactured before September 1, 1993, may use either of the following procedures; vehicles manufactured on or after September 1, 1993, must use procedure 1.

- (1) With the vehicle loaded to GVWR, make 500 snubs at 10 fpsps between 40 mph and 20 mph. Start each snub as soon as the vehicle reaches 40 mph, or 1.5 miles from the start of the preceding one, whichever comes first, but in no case less than 1 mile from the start of the preceding snub.

Adjust the brakes in accordance with the manufacturers published recommendations after 125, 250, and 375 snubs, and after completing burnish.

- (2) With the vehicle loaded to GVWR, burnish the brakes by making 500 snubs at 10 fpsps in 5 series, from the speed indicated below to 20 mph. Start each snub as soon as the vehicle reaches the specified speed, or 1.5 miles from the start of the preceding one, whichever comes first, but in no case less than 1 mile from the start of the preceding snub. If in any snub any brake reaches 500°F, the speed of the following snubs shall be chosen (up to 60 mph) to keep the temperature between 450°F and 550°F.

15. COMPLIANCE TEST EXECUTION....Continued

SERIES	NUMBER OF SNUBS	SPEED
1	175	40 mph
2	25	45 mph
3	25	50 mph
4	25	55 mph
5	250	60 mph

Adjust the brakes in accordance with the manufacturers published recommendations after 125, 250, and 375 snubs, and after completing burnish.

15.6 SECOND EFFECTIVENESS TEST (S7.5)

(Applies to vehicles with a GVWR of 10,000 pounds or less and school buses.)

Make 6 stops from 30 mph and 6 stops from 60 mph. Record the stopping distances.

Vehicles with a GVWR of 10,000 pounds or less must also make 4 stops from 80 mph (only if the vehicle speed attainable in 2 miles is 84 mph or greater.)

15.7 FIRST REBURNISH (S7.6)

Repeat burnish procedure set forth in 15.5, but making only 35 snubs. If procedure 15.5.B.1 is used, reburnish the brakes by making 35 snubs from 60 to 20 mph, except that if the hottest brake reaches 450°F, the subsequent snubs should be started at 60 mph minus 5 mph, 10 mph, 15 mph, or other multiple of 5 mph, such that the hottest brake is between 450°F and 550°F.

15.8 PARKING BRAKE TESTS (S7.7)

(Applies to vehicles with a GVWR of 10,000 pounds or less and school buses.)

The parking brake tests of 15.8.1 or 15.8.2 and 15.8.3 are to be conducted in the order defined by the manufacturer or the COTR, but if the parking brake does not use the same friction elements as the service brake, any burnishing recommended by the manufacturer to the owner should be executed before testing. Record the temperature of non-service brake friction elements.

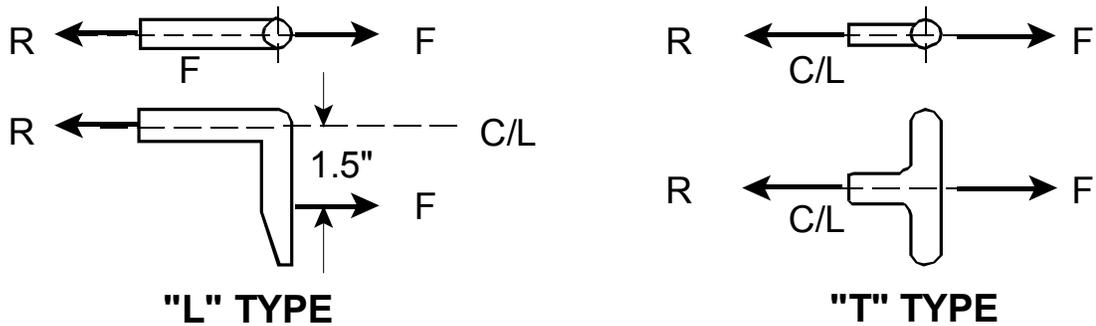
All parking tests require an initial brake temperature of less than 150°F, averaging the temperatures of the brakes to be used. All tests are made both facing up and facing down the grade, at LLVW and GVWR.

15. COMPLIANCE TEST EXECUTION....Continued

Force on the service brake pedal shall be 150 pounds and shall be recorded prior to release when checking parking brake holding capacity.

The force required to apply the brake by hand should be measured at the location indicated in Figure 3.

LOCATION FOR MEASURING HAND BRAKE APPLICATION FORCE



F = APPLIED

R = REACTION

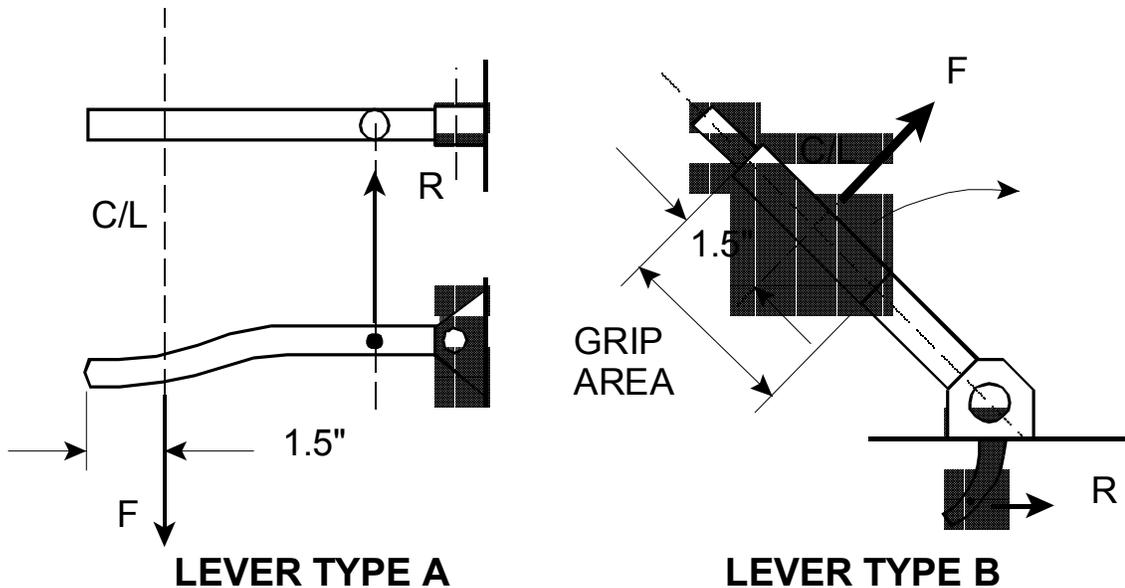


FIGURE 3

15. COMPLIANCE TEST EXECUTION....Continued

15.8.1 FULLY LOADED VEHICLE (GVWR): NEUTRAL TEST (S7.7.1)

With the vehicle loaded to GVWR, position it facing uphill on a surface inclined at 30 percent (16.7 degrees) (for passenger car and school bus with GVWR of 10,000 pounds or less) or 20 percent (11.3 degrees) (for MPV, truck, and bus (other than a school bus) with a GVWR of 10,000 pounds or less and a school bus with a GVWR greater than 10,000 pounds) to the horizontal. Hold the vehicle with the service brake. Place the transmission in neutral.

For vehicles with a GVWR of 10,000 pounds or less, apply the parking brake with the fewest possible movements to develop a force not to exceed 125 pounds for a foot-operated or 90 pounds for a hand-operated system.

For school buses with a GVWR greater than 10,000 pounds, apply the parking brake with the fewest possible movements to develop a force not to exceed 150 pounds for a foot-operated system or 125 pounds for a hand-operated system.

Release the service brake completely. If the vehicle rolls, stop it with the service brake and reapply the force specified above, without releasing any ratcheting or other holding device. If the vehicle again rolls, again stop it and reapply the specified force. Unless the vehicle remains stopped for 5 minutes to the limit of traction of the braked wheels, it FAILS.

Check the operation of the parking brake indicator lamp.
Repeat the test with the vehicle parked facing downhill.

15.8.2 FULLY LOADED VEHICLE (GVWR): "PARK" TEST (S7.7.2)

A vehicle on which the ignition (START) key cannot be removed unless the transmission control is in "PARK" may, at the manufacturer's option, be tested as follows:

Position the vehicle facing uphill on a surface inclined at 30 percent to the horizontal. Hold the vehicle on the grade with the service brake. Place the transmission in "PARK". Apply the parking brake with the fewest possible movements to develop a force of 125 pounds for a foot-operated or 90 pounds for a hand-operated system. Unless the vehicle remains stopped for five minutes in this mode to the limit of traction of the braked wheels, it FAILS.

Position vehicle on a 20 percent grade oriented as above. Hold the vehicle on the grade with the service brake. Place the transmission in neutral. Apply the parking brake to 125 pounds for a foot-operated or 90 pounds for a hand-operated system. Release service brake completely. If the vehicle rolls, stop it with the

15. COMPLIANCE TEST EXECUTION....Continued

service brake and reapply the specified force without releasing any ratcheting or other holding device. If the vehicle again rolls, again stop it and reapply the specified force. Unless vehicle remains stopped for 5 minutes in this mode to the limit of traction of the braked wheels, it FAILS.

Repeat the test with vehicle facing downhill.

15.8.3 LIGHTLY LOADED VEHICLE (S7.7.3)

Unload the vehicle to LLVW (Unloaded Vehicle Weight (UVW) plus 400 pounds including the driver and instrumentation).

Perform Test 15.8.2 or 15.8.3, above, as applicable.

15.9 THIRD EFFECTIVENESS TEST (S7.8) (Applies to vehicles with a GVWR less than 8,000 pounds and school buses)

With the vehicle at LLVW, make 6 stops from 60 mph. Record the stopping distance.

15.10 PARTIAL SERVICE BRAKE FAILURE (S7.9)**15.10.1 PARTIAL FAILURE TEST, LIGHTLY LOADED: FIRST SUBSYSTEM (S7.9.1)**

With the vehicle at LLVW, alter the service brake system to simulate a rupture or leakage failure of one subsystem other than a structural failure of a housing that is common to two or more subsystems.

Record the alteration made, brake application force, and pressure level or fluid level at which the brake system indicator lamp lights.

If the vehicle is **equipped with a split service brake system**, make 4 stops from 60 mph. Record the stopping distance.

If the vehicle is **not equipped with a split service brake system**, make 10 stops from 60 mph. Record the stopping distance.

Restore the service brake system to normal functioning.

15.10.2 PARTIAL FAILURE TEST, LIGHTLY LOADED; ADDITIONAL SUBSYSTEM (S7.9.2)

Repeat 15.10.1 for each of the other subsystems.

15. COMPLIANCE TEST EXECUTION....Continued

15.10.3 PARTIAL FAILURE TEST; FULLY LOADED (S7.9.3)

Reload vehicle to the GVWR. Repeat 15.10.1 and 15.10.2 until all subsystems have been altered.

Restore the service brake system to normal functioning.

15.10.4 ANTI-LOCK AND VARIABLE PROPORTIONING BRAKE SYSTEM TEST (S7.9.4)

For each anti-lock or variable proportioning subsystem provided, disconnect, one at a time, the source of power or otherwise render the subsystem inoperative.

Make 4 stops from 60 mph. Record the stopping distance.

Determine whether the brake system indicator lamp lights when an anti-lock subsystem is disabled.

15.11 POWER FAILURE TEST (S7.10)

On a vehicle with brake power assist or power units, perform either 15.11.1 below or one of the tests A, B, or C in 15.11.2 at the option of the vehicle manufacturer.

15.11.1 REGULAR PROCEDURE (S7.10.1)

Disconnect the power supply to only one unit. Exhaust the reserve of energy in the disconnected system.

Make 4 stops from 60 mph, using one continuous application of the service brake for each stop. Record the stopping distance.

Restore the system to normal operating condition. Repeat test above until all units have been tested.

15.11.2 OPTIONAL PROCEDURE (S7.10.2)

Charge brake power assist units, or brake power units, to maximum, e.g., by running the engine up to speed and reducing speed quickly. Do not recharge during the test.

Disconnect the primary source of power to the unit.

15. COMPLIANCE TEST EXECUTION....Continued

- A1. **For passenger cars with brake power assist units**, make 6 stops from 60 mph. Apply the control force as quickly as possible, and attain the average decelerations or equivalent stopping distances shown in Table 14.

Then deplete the system of any reserve energy, and make another stop at a deceleration of 7 fpsps (equivalent stopping distance 554 feet).

TABLE 14

Stop Number	Deceleration	Equivalent Stopping Distance
1	16 fpsps	242 feet
2	12 fpsps	323 feet
3	10 fpsps	388 feet
4	9 fpsps	431 feet
5	8 fpsps	484 feet
6	7.5 fpsps	517 feet

Requirement: The brake application force does not exceed 150 pounds for any of the above 7 stops.

- A2. **For passenger cars with accumulator-type brake power units**, make 10 stops from 60 mph. Apply the control force as quickly as possible, and attain the average decelerations or equivalent stopping distances shown in Table 15.

15. COMPLIANCE TEST EXECUTION....Continued

TABLE 15

Stop Number	Deceleration	Equivalent Stopping Distance
1	16 fpsps	242 feet
2	13 fpsps	298 feet
3	12 fpsps	323 feet
4	11 fpsps	352 feet
5	10 fpsps	388 feet
6	9.5 fpsps	409 feet
7	9 fpsps	431 feet
8	8.5 fpsps	456 feet
9	8 fpsps	484 feet
10	7.5 fpsps	517 feet

Then deplete the disconnected unit of any reserve energy, and make another stop at a deceleration of 7 fpsps (equivalent stopping distance 554 ft).

Requirement: The brake application force does not exceed 150 pounds for any of the preceding 11 stops.

- B1. **For vehicles Other Than Passenger Cars with a GVWR of 10,000 pounds or less, and vehicles with a GVWR greater than 10,000 pounds, with brake power assist units,** make 6 stops from 60 mph. Apply the control force as quickly as possible, and attain the average decelerations or equivalent stopping distances shown in Table 16.

15. COMPLIANCE TEST EXECUTION....Continued

TABLE 16

Stop Number	Deceleration	Equivalent Stopping Distance
1	14 fpsps	277 feet
2	12 fpsps	323 feet
3	10 fpsps	388 feet
4	8.5 fpsps	456 feet
5	7.5 fpsps	517 feet
6	6.7 fpsps	580 feet

Then deplete the system of any reserve energy, and make another stop at a deceleration of 6 fpsps (equivalent stopping distance of 646 feet).

Requirement: The brake application force does not exceed 150 pounds for any of the above 7 stops.

- B2. **For vehicles Other Than Passenger Cars with a GVWR of 10,000 pounds or less, and vehicles with a GVWR greater than 10,000 pounds, with accumulator-type brake power units,** make 10 stops from 60 mph. Apply the control force as quickly as possible, and attain the average decelerations or equivalent stopping distances shown in Table 17.

15. COMPLIANCE TEST EXECUTION....Continued

TABLE 17

Stop Number	Deceleration	Equivalent Stopping Distance
1	13 fpsps	298 feet
2	11 fpsps	352 feet
3	10 fpsps	388 feet
4	9.5 fpsps	409 feet
5	9 fpsps	431 feet
6	8.5 fpsps	456 feet
7	8 fpsps	484 feet
8	7.5 fpsps	517 feet
9	7 fpsps	554 feet
10	6.5 fpsps	596 feet

Then deplete the disconnected unit of any reserve energy, and make another stop at a deceleration of 6 fpsps (equivalent stopping distance of 646 feet).

Requirement: The brake application force does not exceed 150 pounds for any of the above 11 stops.

- C. **For all vehicles with back-up systems actuated automatically in the event of a primary power failure**, disconnect the primary source of power to one subsystem. Make 15 stops from 60 mph, attaining for each an average deceleration of 12 fpsps (equivalent stopping distance of 323 feet). Restore the system to normal functioning condition. Repeat the test in A or B or C until all subsystems have been tested.

15.12 FIRST FADE/RECOVERY TEST (S7.11)

15.12.1 BASELINE CHECK STOPS (S7.11.1) (Applies to vehicles with GVWR of 10,000 pounds or less)

Make 3 stops from 30 mph at 10 fpsps. Control force readings at speeds below 5 mph are to be disregarded.

15. COMPLIANCE TEST EXECUTION....Continued

Requirement: Application force not less than 10 pounds or greater than 60 pounds.

Calculate the average of the maximum brake control force in the 3 stops.

Applies to vehicles with GVWR greater than 10,000 pounds.

Make 3 snubs from 40 mph to 20 mph at 10 fpsps. Transmission should be positioned in neutral or declutched.

Requirement: Application force not less than 10 pounds or greater than 90 pounds.

Calculate the average of the maximum brake control force in the 3 stops.

15.12.2 FADE STOPS OR SNUBS (S7.11.2)

Attain an initial brake temperature of 130°F to 150°F.

Applies to vehicles with a GVWR of 10,000 pounds or less.

Make 10 stops from 60 mph, at 15 fpsps for the first 5 and the maximum deceleration attainable between 5 fpsps and 15 fpsps for the second 5 stops. Attain the specified deceleration within 1 second and, as a minimum, maintain it for the remainder of the stopping time. Brake application force readings at speeds below 5 mph are to be disregarded. After each stop, immediately accelerate to 60 mph. A distance of 0.4 miles is required from the start of one brake application to the start of the next.

Requirement: The first 5 stops achieve 15 fpsps deceleration and the second group of 5 stops be made at not less than 5 fpsps deceleration without exceeding 150 pound pedal force.

After the last stop, drive for 1 mile at 30 mph and begin the recovery procedure described in 15.12.3.

Applies to vehicles with a GVWR greater than 10,000 pounds.

With the transmission positioned in neutral, or declutched, make 10 snubs from 40 mph to 20 mph at 10 fpsps. Attain the specified deceleration within one second and maintain it for the remainder of the snubbing time. After each snub, immediately accelerate to 40 mph. Leave an interval of 30 seconds from the start of one brake application to the start of the next.

15. COMPLIANCE TEST EXECUTION....Continued

After the last snub, drive for 1.5 miles at 40 mph and begin the recovery procedure described in 15.12.3

15.12.3 RECOVERY STOPS OR SNUBS (S7.11.3) (Applies to vehicles with a GVWR of 10,000 pounds or less)

Make 5 stops from 30 mph at 10 fpsps. Control forces recorded below 5 mph are to be disregarded. After each stop, accelerate at full power to 30 mph and maintain that speed until a distance of 1 mile from the beginning of the previous stop is reached.

Requirement: The maximum force for the first 4 stops be less than 150 pounds, and the 5th stop be less than 20 pounds greater than the baseline force; and that the minimum force be greater than or equal to either the baseline force minus 10 pounds, or baseline force times 0.60, whichever is less, but not less than 5 pounds.

Applies to vehicles with a GVWR greater than 10,000 pounds.

With the transmission positioned in neutral, make 5 snubs from 40 mph to 20 mph at 10 fpsps. After each snub, accelerate at full power to 40 mph and maintain that speed until a distance of 1.5 miles from the beginning of the previous snub is reached.

Requirement: The maximum force for the first 4 snubs be less than 150 pounds, and the 5th snub be less than 20 pounds greater than the baseline force; and that the minimum force be greater than or equal to either the baseline force minus 10 pounds, or baseline force times 0.60, whichever is less, but not less than 5 pounds.

15.13 SECOND REBURNISH (S7.12)

Repeat reburnish procedure set forth in 15.7.

15.14 SECOND FADE/RECOVERY TEST (S7.13)

Repeat 15.12, except that in 15.12.2, make 15 fade stops or 20 snubs.

15.15 THIRD REBURNISH (S7.14)

Repeat reburnish procedure set forth in 15.7

15. COMPLIANCE TEST EXECUTION....Continued**15.16 FOURTH EFFECTIVENESS TEST (S7.15) (Applies to vehicles with a GVWR of 10,000 pounds or less and school buses.)**

Make 6 stops from 30 mph and 6 stops from 60 mph. Record the stopping distances.

Vehicles with a GVWR of 10,000 pounds or less must also make 4 stops from 80 mph (if the vehicle will attain 84 mph in 2 miles). Record the stopping distances.

Passenger Cars must also make 4 stops from 95 mph (if the vehicle will attain 99 mph in 2 miles); or, make 4 stops from 100 mph (if the vehicle will attain 104 mph in 2 miles).

15.17 WATER RECOVERY TEST (S7.16)**15.17.1 BASELINE FORCE (S7.16.1)**

Make 3 stops from 30 mph at 10 fpsps. Force readings at speeds below 5 mph are to be disregarded. Calculate the average of the 3 brake application forces.

15.17.2 WET BRAKE STOPS (S7.16.2)

Drive the vehicle in water 6 inches deep for 2 minutes at 5 mph, using either forward or reverse gears but NOT using the brakes.

Immediately after leaving the water, make 5 stops by accelerating at full power to 30 mph and stopping at 10 fpsps.

Requirement: The maximum control force for the first 4 stops be not more than 150 pounds, and for the 5th stop be not more than either 90 pounds or the baseline force plus 45 pounds; and that the minimum control force be not less than either the baseline force minus 10 pounds or the baseline force times 0.60, whichever is less, but not less than 5 pounds.

15.18 SPIKE STOPS (S7.17) (Applies to vehicles with a GVWR of 10,000 pounds or less.)

Make 10 spike stops (by applying a force of 200 pounds to the service brake within 0.08 seconds) from 30 mph with the transmission positioned in neutral. Immediately following the spike applications, make 6 effectiveness stops from 60 mph. Record the stopping distances.

Requirement: One stop be made within 204 feet (Passenger Cars) or 216 feet (vehicles Other Than Passenger Cars).

15. COMPLIANCE TEST EXECUTION....Continued

15.19 FINAL INSPECTION (S7.18)

15.19.1 BRAKE SYSTEM INTEGRITY (S5.6)

Inspect the service brake system for detachment or fracture of any components (such as shoes, pads, or springs).

Requirement: Separation of friction material of each frictional element shall NOT exceed 10 percent by area.

Inspect the friction surfaces, the fluid reservoir cover and seal, and the filler openings for leakage of fluid or lubricant.

15.19.2 BRAKE FLUID RESERVOIR (S5.4.1)

Requirement: 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.

15.19.2.1 RESERVOIR CAPACITY (S5.4.2)

Inspect the fluid reservoirs for minimum capacity, which shall be NOT LESS THAN the displacement resulting when the pistons move from a new lining, fully retracted position to the largest of - -

- A. Linings worn down to rivet or bolt heads
- B. Linings worn to within 0.03125 inch of a bond
- C. Limit recommended by the manufacturer (with drums or rotors of nominal design thickness and clearances normally adjusted).

Requirement: Reservoirs shall have completely separate compartments for each subsystem; 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 accumulators(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.

15. COMPLIANCE TEST EXECUTION....Continued

15.19.2.2 RESERVOIR LABELING (S5.4.3)

Inspect the fluid reservoirs for the presence of a warning statement reading, in letters at least 0.125 inch high, "WARNING, Clean filler cap before removing, Use only DOT fluid from a sealed container." (Inserting the recommended type of brake fluid as specified in 49 CFR 571.116, e.g., "DOT 3".)

Requirement: The lettering is to be - -

- A. Permanently affixed, engraved, or embossed
- B. In direct view within not more than 4 inches of the filler plug or cap
- C. If not engraved or embossed, of a color contrasted with the background

15.19.3 BRAKE SYSTEM INDICATOR LAMP (S5.3)

Inspect the brake system indicator lamp(s). Each vehicle shall have one or more brake system indicator lamps, mounted in front of and in clear view of the driver, which meet the following requirements.

15.19.3.1 ENGINE RUNNING OR NOT RUNNING (S5.3.1)

For vehicles manufactured with a split service brake system, an indicator lamp shall be actuated when the ignition (start) switch is in the "On" ("Run") position, an automatic transmission is NOT in a forward or reverse drive position, and whenever any of the conditions A, C, or D occur, or B, C, or D occur:

- A. A gross loss of 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) due to any one of the following conditions:
 - (1) Before or upon application of 50 pounds of control force upon a fully manual service brake.
 - (2) Before or upon application of 25 pounds of control force upon a service brake with a brake power assist unit.
 - (3) Before or upon application of a differential pressure of not more than 225 pounds per square inch between the active and failed brake system measured at a master cylinder outlet or a slave cylinder outlet.
 - (4) When the supply pressure in a brake power unit drops to a level not less than one-half of the normal system pressure.

15. COMPLIANCE TEST EXECUTION....Continued

- B. A drop in the level of brake fluid in a master cylinder reservoir to less than the recommended safe level specified by the manufacturer or to less than one-fourth of the fluid reservoir capacity in any reservoir compartment, whichever is greater.
- C. A total functional electrical failure in an anti-lock or variable proportioning brake system.
- D. Application of the parking brake.

Vehicles manufactured without a split service brake system shall be equipped with a warning indicator that activates under the conditions specified in A.(4) above when the ignition (start) switch is not in forward or reverse drive position. The indicator shall consist of a continuous or intermittent audible signal and a flashing warning light, displaying the words of "STOP-BRAKE FAILURE" in block capital letters not less than 0.250 inch in height.

15.19.3.2 ENGINE NOT RUNNING (S5.3.2)

All indicator lamps shall be activated as a check of lamp 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. However, in vehicles equipped with an automatic transmission, the activation as a check of lamp function is not required when the transmission shift lever is in a forward or reverse drive position.

15.19.3.3 LENGTH OF ACTIVATED CONDITION (S5.3.3)

Each indicator lamp activated due to a condition identified in S5.3.1 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.

15.19.3.4 STEADY OR FLASHING OPTION (S5.3.4)

For split service systems, when the indicator lamp is activated, it may be steady burning or flashing.

15. COMPLIANCE TEST EXECUTION....Continued

15.19.3.5 LEGIBILITY OF INDICATOR (S5.3.5)

For split service systems, each indicator lamp shall have a lens labeled in letters not less than 0.125 inch high which shall be legible to the driver in daylight when lighted. The lens and the letters shall have contrasting colors, one of which is red. If a single common indicator is used, the lens shall be labeled "Brake". If separate indicator lamps are used for one or more of the various functions described in 15.19.3.1, A through D, the lens shall include the word "Brake" and appropriate additional labeling (use "Brake Pressure", "Brake Fluid" for 15.19.3.1, A and B, except that if a separate parking indicator lamp is provided, the single word "Park" may be used). An anti-lock system may have a separate lens labeled "Anti-lock," "Antilock," or "ABS" in letters NOT LESS than 0.125 inch high which shall be legible to the driver in daylight when lighted if the indicator is used only for the anti-lock system. The lens and the letters shall have contrasting colors, one of which is yellow.

15.20 MOVING BARRIER TEST (S7.19)

If the vehicle has been tested according to 15.8.2, the moving barrier test is to be performed, both from the front and the rear. (The vehicle used for the moving barrier test need not be the one used for the other braking tests.)

Load the vehicle to GVWR. Locate it on a level surface with the parking brake released and the transmission control in "PARK." Impact the vehicle from straight ahead with a moving barrier (see Test Equipment, Section 11) at 2.5 mph. Repeat the test with the barrier impacting from straight behind at the same speed.

Requirement: The parking mechanism shall not release or be damaged by the two impacts. Check the condition of the parking mechanism by parking the vehicle on an approximate 10 percent (5.7 degrees) grade facing up and down.

16. INSTRUCTIONS FOR COMPLETING DATA SHEETS

TEST DATA SHEETS

Data from each test is entered on the appropriate data sheet in Section 19 as the test is conducted. Upon completion of all the tests on a particular vehicle, information is extracted from these sheets and transferred to the summary sheets where the vehicle performance is compared with the FMVSS 105-83 requirements.

NOTE: DATA SHEETS ENCLOSED IN THIS TEST PROCEDURE IDENTIFY THE STOPPING DISTANCE REQUIREMENTS FOR PASSENGER CARS. FOR OTHER CLASSES OF VEHICLES, THE DATA SHEETS SHOULD BE MODIFIED TO REFLECT APPROPRIATE STOPPING DISTANCE REQUIREMENTS.

SUMMARY SHEETS

Summary sheets indicating the test phase, requirements, actual performance, and a pass or fail column shall be used. Visual data shall be analyzed to determine summary performance unless unavailable or incongruent with verified recorded data (explanation required in either case).

17. POST TEST REQUIREMENTS

Contractor shall re-verify all instrumentation and check data sheets.

18. REPORTS

18.1. Monthly Status Reports

The contractor shall submit a monthly Test Status Report and a Vehicle or Equipment Status Report to the COTR. The Vehicle or Equipment Status Report shall be submitted until all vehicles or items of equipment are disposed of. See Forms Section for samples of the required Monthly Status Reports.

18.2. Apparent Test Failure

Any indication of a test failure shall be communicated by telephone to the COTR within 24 hours with written notification mailed within 48 hours (Saturday and Sunday hours excluded). A Notice of Test Failure (see Section 20, "Forms") with a copy of the particular compliance test data sheet(s) and preliminary data plot(s) shall be included. In the event of a test failure, a posttest calibration check of some critically sensitive test equipment and instrumentation may be required for verification of accuracy. The necessity for the calibration shall be at the COTR's discretion and shall be performed without additional costs to the OVSC.

18.3. Final Test Reports

18.3.1 Copies

In the case of a test failure, **seven** copies of the Final Test Report shall be submitted to the COTR for acceptance within three weeks of test completion. The Final Test Report format to be used by all contractors can be found in this section.

Where there has been no indication of a test failure, **three** copies of each Final Test Report shall be submitted to the COTR for acceptance within three weeks of test completion. Payment of contractor's invoices for completed compliance tests may be withheld until Final Test Report acceptance by the COTR. Contractors are requested to NOT submit invoices before the COTR is provided with copies of the Final Test Report.

Contractors are required to submit the first Final Test Report in draft form within two weeks after the compliance test is conducted. The contractor and the COTR will then be able to discuss the details of both test conduct and report content early in the compliance test program.

Contractors are required to PROOF READ all Final Test Reports before submittal to the COTR. The OVSC will not act as a report quality control office for contractors. Reports containing a significant number of errors will be returned to the contractor for correction, and a "hold" will be placed on invoice payment for the particular test.

18. REPORTS....Continued

18.3.2 Requirements

The Final Test Report, associated documentation (including photographs) are relied upon as the chronicle of the compliance test. The Final Test Report will be released to the public domain after review and acceptance by the COTR. For these reasons, each final report must be a complete document capable of standing by itself and containing all data sheets.

The contractor should use **detailed** descriptions of all compliance test events. Any events that are not directly associated with the standard but are of technical interest should also be included. The contractor should include as much **detail** as possible in the report.

Instructions for the preparation of the first three pages of the final test report are provided for standardization.

18.3.3 First Three Pages

A. FRONT COVER

A heavy paperback cover (or transparency) shall be provided for the protection of the final report. The information required on the cover is as follows:

Final Report Number such as 105-ABC-9X-001 where - -

105 is the FMVSS tested

ABC are the initials for the laboratory

9X is the Fiscal Year of the test program

001 is the Group Number (001 for the 1st test, 002 for the 2nd test, etc.)

Final Report Title And Subtitle such as

SAFETY COMPLIANCE TESTING FOR FMVSS 105

Hydraulic Brake Systems

Name of Vehicle Manufacturer

Model Year, Make/Model, Body Style

NHTSA Number Test Vehicle

Contractor's Name and Address such as

COMPLIANCE TESTING LABORATORIES, INC.

4335 West Dearborn Street

Detroit, Michigan 48090

18. REPORTS....Continued

NOTE: DOT SYMBOL WILL BE PLACED BETWEEN ITEMS (3) AND (4)

Date of Final Report Completion such as "March 15, 199X"

The words "FINAL REPORT"

The sponsoring agency's name and address as follows - -

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Safety Assurance
Office of Vehicle Safety Compliance
400 Seventh Street, SW
Room 6115 (NSA-30)
Washington, DC 20590

18. REPORTS....Continued

B. FIRST PAGE AFTER FRONT COVER

A disclaimer statement and an acceptance signature block for the COTR shall be provided as follows

This publication is distributed by the U. S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared By: _____

Approved By: _____

Approval Date: _____

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By: _____

Acceptance Date: _____

18. REPORTS....Continued**C. SECOND PAGE AFTER FRONT COVER**

A completed Technical Report Documentation Page (Form DOT F1700.7) shall be completed for those items that are applicable with the other spaces left blank. Sample data for the applicable block numbers of the title page follows.

Block 1 — REPORT NUMBER

105-ABC-9X-001

Block 2 — GOVERNMENT ACCESSION NUMBER

Leave blank

Block 3 — RECIPIENT'S CATALOG NUMBER

Leave blank

Block 4 — TITLE AND SUBTITLE

Final Report of FMVSS 105 Compliance Testing of 199X Ace Super 2-door Coupe, NHTSA No. CX0401

Block 5 — REPORT DATE

March 15, 199X

Block 6 — PERFORMING ORGANIZATION CODE

ABC

Block 7 — AUTHOR(S)

John Smith, Project Manager / Bill Doe, Project Engineer

Block 8 — PERFORMING ORGANIZATION REPORT NUMBER

ABC-DOT-XXX-001

Block 9 — PERFORMING ORGANIZATION NAME AND ADDRESS

ABC Laboratories
405 Main Street
Detroit, MI 48070

18. REPORTS....Continued**Block 10 — WORK UNIT NUMBER**

Leave blank

Block 11 — CONTRACT OR GRANT NUMBER

DTNH22-9X-D-12345

Block 12 — SPONSORING AGENCY NAME AND ADDRESS

U.S. Department of Transportation
National Highway Traffic Safety Administration
Safety Assurance
Office of Vehicle Safety Compliance (NSA-30)
400 Seventh Street, SW, Room 6115
Washington, DC 20590

Block 13 — TYPE OF REPORT AND PERIOD COVERED

Final Test Report
Feb. 15 to Mar. 15, 199X

Block 14 — SPONSORING AGENCY CODE

NSA-30

Block 15 — SUPPLEMENTARY NOTES

Leave blank

Block 16 — ABSTRACT

Compliance tests were conducted on the subject 199X Ace Super 2-door coupe in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-105-83-0X for the determination of FMVSS 105 compliance. Test failures identified were as follows:

None

NOTE: Above wording must be shown with appropriate changes made for a particular compliance test. Any questions should be resolved with the COTR.

18. REPORTS....Continued**Block 17 — KEY WORDS**

Compliance Testing
Safety Engineering
FMVSS 105

Block 18 — DISTRIBUTION STATEMENT

Copies of this report are available from —

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Block 22 — PRICE

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18. REPORTS....Continued

18.3.4 Table of Contents

Final test report Table of Contents shall include the following:

Section 1 — Purpose of Compliance Test

Section 2 — Compliance Test Data Summary

Section 3 — Compliance Test Data

Section 4 — Noncompliance Data (if applicable)

Section 5 — Photographs

Section 6 — Test Equipment List and Calibration Information