

TP-121V-05
March 12, 2004

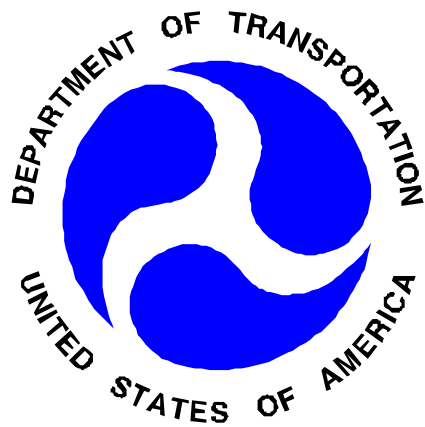
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

LABORATORY TEST PROCEDURE

FOR

FMVSS No. 121

Air Brake Systems



ENFORCEMENT
Office of Vehicle Safety Compliance
Room 6111, NVS-220
400 Seventh Street, SW
Washington, DC 20590

OVSC LABORATORY TEST PROCEDURE
TABLE OF CONTENTS

	PAGE
1. PURPOSE AND APPLICATION	1
2. SECURITY.....	2
3. GOOD HOUSEKEEPING	2
4. TEST SCHEDULING AND MONITORING	3
5. GOVERNMENT FURNISHED PROPERTY.....	3
6. FACILITY AND EQUIPMENT	3
7. CALIBRATION OF TEST INSTRUMENTS	4
8. PHOTOGRAPHIC DOCUMENTATION	5
9. DEFINITIONS.....	7
10. TEST EXECUTION.....	12
10.1 VERIFICATION OF REQUIRED EQUIPMENT	12
10.2 LABORATORY TESTS	15
10.3 ROAD TESTS	29
11. REPORTS.....	44
12. DATA SHEETS	49
13. VEHICLE CONDITION REPORT	77
14. LABORATORY NOTICE OF TEST FAILURE	80
15. MONTHLY STATUS REPORT.....	81

**REVISION CONTROL LOG
FOR OVSC LABORATORY
TEST PROCEDURES**

TP-121V-05
AIR BRAKE SYSTEMS
VEHICLE TEST

TEST PROCEDURE		FMVSS 121V		DESCRIPTION
REV. No.	DATE	AMENDMENT	EFFECTIVE DATE	
01	2/6/74			Minor update
02	3/16/78			Minor update
03	9/12/97	60FR13216	3-1-97	Braking-in-a-curve, Truck Tractors
04	6/4/99			Minor revisions
05	3/12/04	68FR 47485	10-10-03	Braking-in-a-curve, Trucks and buses
06				
07				
08				
09				

1. PURPOSE AND APPLICATION

The Office of Vehicle Safety Compliance (OVSC) provides contractor laboratories with Laboratory Test Procedures 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. If any contractor views any part of an OVSC Laboratory Test Procedure to be in conflict with a Federal Motor Vehicle Safety Standard (FMVSS) or observes deficiencies in a Laboratory Test Procedure, the contractor is required to advise the Contracting Officer's Technical Representative (COTR) and resolve the discrepancy prior to the start of compliance testing.

Every contractor is 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 contractor's test procedure shall contain a complete listing of test equipment with make and model number and a detailed check-off sheet. The list of test equipment shall include instrument accuracy and calibration dates. All equipment shall be calibrated in accordance with the manufacturer's instructions. There shall be no contradictions between the Laboratory Test Procedure and the contractor's in-house test procedure. Written approval of the in-house test procedures shall be obtained from the COTR before initiating the compliance test program. The OVSC Laboratory Test Procedures are not intended to limit or restrain a contractor from developing or utilizing any testing techniques or equipment that will assist in procuring the required compliance test data. These Laboratory Test Procedures do not constitute an endorsement or recommendation for use of any product or method. However, the application of any such testing technique or equipment is subject to prior approval of the COTR.

NOTE: The OVSC Laboratory Test Procedures, prepared for the limited purpose of use by independent laboratories under contract to conduct compliance tests for the OVSC, are not rules, regulations or NHTSA interpretations regarding the meaning of a FMVSS. The Laboratory Test Procedures 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. Recognizing applicable test tolerances, the Laboratory Test Procedures may

1. PURPOSE AND APPLICATION....Continued

specify test conditions that are less severe than the minimum requirements of the standard. In addition, the Laboratory Test Procedures may be modified by the OVSC at any time without notice, and the COTR may direct or authorize contractors to deviate from these procedures, as long as the tests are performed in a manner consistent with the standard itself and within the scope of the contract. Laboratory Test Procedures may not be relied upon to create any right or benefit in any person. Therefore, compliance of a vehicle or item of motor vehicle equipment is not necessarily guaranteed if the manufacturer limits its certification tests to those described in the OVSC Laboratory Test Procedures.

2. SECURITY

The contractor shall provide appropriate security measures to protect the OVSC test vehicles, items of motor vehicle equipment, and Government Furnished Property (GFP) from unauthorized personnel during the entire compliance testing program. The contractor is financially responsible for any acts of theft and/or vandalism that occur during the storage of test vehicles, items of motor vehicle equipment and GFP. Any security problems that arise shall be reported by telephone to the Industrial Property Manager (IPM), Office of Contracts and Procurement, within one working day after the incident. A letter containing specific details of the security problem will be sent to the IPM (with copy to the COTR) within two working days.

The contractor shall protect and segregate the data that evolves from compliance testing before and after each vehicle or item of motor vehicle equipment test. No information concerning the vehicle or equipment item safety compliance testing program shall be released to anyone except the COTR, unless specifically authorized by the COTR or the COTR's Group Supervisor or Division Chief.

No individuals, other than contractor personnel directly involved in the compliance testing program, shall be allowed to witness any vehicle or equipment item compliance test unless specifically authorized by the COTR.

3. GOOD HOUSEKEEPING

Contractors shall maintain the entire vehicle or item of motor vehicle equipment, 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.

4. 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 with the COTR to allow monitoring by OVSC personnel.

5. GOVERNMENT FURNISHED PROPERTY (GFP)

ACCEPTANCE OF TEST VEHICLE

The Contractor is responsible for accepting test vehicles as GFP in accordance with the contract and in-house test procedures. The Contractor shall conduct a thorough inspection of the test vehicle at the time of delivery and acceptance. The results of the inspection shall be recorded on a Vehicle Condition Form and faxed to the COTR within 72 hours of the vehicle's arrival at the Contractor's test facility.

STORAGE

Government furnished property shall be segregated from Contractor's property and stored in a secured area.

6. FACILITY AND EQUIPMENT

TEST TRACK REQUIREMENTS

A. Service and Emergency Stopping Distance Tests

Tests shall be conducted on a straight 12 ft (+2 in/-0 in) wide roadway with a peak friction coefficient (PFC) of 0.9 (dry Portland cement concrete or equivalent surface). The PFC shall be measured using an American Society for Testing and Materials (ASTM) E1136 standard reference test tire, in accordance with ASTM Method E1337-90, at a speed of 40 mph. The track shall be flat within 1% grade in all directions.

B. Stability and Control Tests

Tests shall be conducted on a 500-ft radius curved (measured at the center) 12 ft (+2 in/-0 in) wide roadway with a PFC of 0.5. The PFC shall be measured for tangent points along the length of the curve using an ASTM E1136 standard reference test tire, in accordance with ASTM Method E1337-90, at a speed of 40 mph, with water delivery.

6. FACILITY AND EQUIPMENT....Continued

The track shall be flat within 1% grade in all directions. The arc length must be at least 300 ft and a 100 ft approach to the arc is recommended to properly align the vehicle to the lane.

C. Parking Brake Tests

- (1) Grade Holding Test - shall be conducted on clean dry Portland cement concrete or equivalent surface and have a grade of 20% (+0 , -1%)
- (2) Static Draw Bar Test - shall be conducted on clean, dry and level Portland cement concrete or equivalent surface

CONTROL TRAILER

The control trailer is an un-braked flatbed semi-trailer which has a single axle with a gross axle weight rating (GAWR) of 18,000 lb. and a length of 258 ± 6 inches when measured from the transverse centerline between the axle to the centerline of the kingpin.

7. 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. 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.

7. CALIBRATION OF TEST INSTRUMENTS...Continued

- 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 that 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. 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. Standards for calibrating the measuring and test equipment shall be stored and used under appropriate environmental conditions to assure their accuracy and stability.

8. PHOTOGRAPHIC DOCUMENTATION

STILL PHOTOGRAPHS

The final test report shall have 8" X 10" color photographs that are properly focused for clear images. A tag, label or placard identifying the test vehicle model and NHTSA number shall appear in each photograph and be legible. Each photograph shall be labeled as to subject matter. As a minimum the following photographs shall be included:

8. PHOTOGRAPHIC DOCUMENTATION

- A. *Frontal view of the vehicle
- B. *Right side view of the vehicle
- C. *Left side view of the vehicle
- D. *Rear view of the vehicle
- E. Vehicle Certification Label Tire information label (if not part of certification label)
- F. Service reservoir(s)
- G. Supply reservoir(s)
- H. Front and Rear Brake chamber(s) including automatic slack adjusters
- I. ABS brake system components
- J. All test instrumentation

* at LLVW and GVWR

In the event of a possible nonconformance, additional photographs shall be taken to document the area of concern.

VIDEO COVERAGE

Videotape coverage of the following tests shall be included with each final test report.

*A. Stability and Control

Pan view of the vehicle braking in all FOUR stops for both GVWR and LLVW configurations.

*B. Service Brake

Pan view of one (preferably, the first) of six stops which shows the vehicle met all requirements, OR, all six stops which show the vehicle did not meet all requirements, for each configuration tested under chapter 10 of this test report

8. PHOTOGRAPHIC DOCUMENTATION.....Continued

*C. Emergency Brake

Pan view of one (preferably, the first) of six stops which shows the vehicle met all requirements, OR, all six stops which show the vehicle did not meet all requirements, for each configuration tested under chapter 10 of this test report

D. Parking Brake (Grade Holding Only)

Videotape both LLVW and GVWR configurations with the vehicle facing up the grade and the vehicle facing down the grade for the complete 5 minute duration of each test. The first minute shall consist of a close-up view of the area where the marked tire contacts the ground. The next three minutes shall consist of a full view of the vehicle on the grade. The final minute shall consist of the view of the tire-to-ground interface with a measurement of vehicle's translation from the original location, if any.

* **NOTE:** Videotape shall clearly display the vehicle, track and lane markers throughout the duration of the braking run from the onset of the first brake application to the point at which the vehicle stops.

9. DEFINITIONS

AIR BRAKE SYSTEM

A system that uses air as medium for transmitting pressure or force from driver control to service brake, including air-over-hydraulic system, but not including a system that uses compressed air or vacuum only to assist driver in applying muscular force to hydraulic or mechanical components.

ANTILOCK BRAKE SYSTEM (ABS)

Portion of service brake system that automatically controls the degree of rotational wheel slip during braking by:

- A. Sensing rate of angular rotation of wheels
- B. Transmitting signals regarding rate of wheel angular rotation to one or more controlling devices that interpret those signals and generate responsive controlling output signals
- C. Transmitting those controlling signals to one or more modulators that adjust brake actuating forces in response to those signals.

9. DEFINITIONS...Continued

AUTO TRANSPORTER

A truck and a trailer designed for use in combination to transport motor vehicles, in that the towing vehicle is designed to carry cargo at a location other than fifth wheel and to load this cargo only by means of the towed vehicle.

AXLE SYSTEM

Arrangement of wheels that lay across vehicle in a line that is perpendicular to longitudinal centerline of vehicle.

BRAKE CHAMBER HOUSING

The case that encloses a brake chamber

COMMON DIAPHRAGM

A single brake chamber diaphragm that is a component of the parking, emergency, and service brake systems.

DIRECTLY CONTROLLED WHEEL

A wheel for which the degree of rotational wheel slip is sensed, either at that wheel or on the axle shaft for that wheel and corresponding signals are transmitted to one or more modulators that adjust the brake actuating forces at that wheel.

EMERGENCY BRAKE

A mechanism designed to stop a motor vehicle after failure of the service brake

FULL –TREADLE BRAKE APPLICATION

A brake application in which the treadle valve pressure in any of the valve's output circuits reaches 85 psi within 0.2 seconds after the application is initiated, or in which maximum treadle travel is achieved within 0.2 seconds after the application is initiated

GROSS AXLE WEIGHT RATING (GAWR)

The value specified by the vehicle manufacturer as the load-carrying capacity of a single axle system, as measured at the tire-ground interfaces.

9. DEFINITIONS...Continued

GROSS VEHICLE WEIGHT RATING (GVWR)

Value specified by the manufacturer as the loaded weight of a single vehicle.

Unless otherwise specified, vehicles are loaded to GVWR as follows:

- A. Trucks are loaded to GVWR using axle loads proportional to respective gross axle weight ratings (GAWR). In the case where ballast cannot be positioned without exceeding GAWR, reduce amount of ballast so that axle load equals specified GAWR, maintaining load proportioning as closely as possible to specified proportioning.
- B. Truck tractors to be loaded to GVWR using single axle un-braked control trailer. Center of gravity of all ballast on control trailer located directly above kingpin. Load distribution to be in proportion to tractor's GAWRs, with trailer axle as close as possible to 4,500 pounds. Adjust load distribution by altering fifth wheel position. In case where tractor fifth wheel cannot be adjusted as specified without exceeding a GAWR, reduce amount of ballast so that axle load equals specified GAWR, maintaining load proportioning as close as possible to specified proportioning.
- C. Actual vehicle test weight to be within + 0%, - 2% of the weight specified in A or B. Axle weights to be within 2% of their proportional share of test weight. Ballast to be located as close as possible to longitudinal centerline of control trailer or truck load frame.

HEAVY HAULER TRAILER

Trailer with one or more of following characteristics:

- A. Brake lines are designed to adapt to separation or extension of vehicle frame; or
- B. Body consists only of platform whose primary cargo-carrying surface is not more than 40 inches above ground in unloaded condition, except that it may include sides that are designed to be easily removable and a permanent front-end structure.

9. DEFINITIONS...Continued

INITIAL BRAKE TEMPERATURE (IBT)

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

BRAKING INTERVAL

The distance measured from the start of one brake application to the start of the next brake application.

LIGHTLY LOADED VEHICLE WEIGHT (LLVW)

The unloaded vehicle weight (UVW) plus up to 500 pounds (including driver, observer, and instrumentation). Lifiable axles shall be lifted for LLVW tests. For safety, a rollbar structure less than 1,000 lb may be added to the vehicle.

MAXIMUM DRIVE-THROUGH SPEED

The highest possible constant speed at which the vehicle can be driven through 200 feet of the arc of a low Mu 500-foot radius curve without leaving a 12-foot wide lane.

MOTOR VEHICLE

Any vehicle driven or drawn by mechanical power manufactured primarily for use on public streets, roads, and highways, except vehicle operated exclusively on rail or rails.

PARKING BRAKE

A mechanism designed to prevent movement of a stationary motor vehicle.

PEAK FRICTION COEFFICIENT (PFC)

The ratio of the maximum value of longitudinal force to simultaneous vertical force occurring prior to wheel lockup, as braking torque is progressively increased, as measured using procedure in ASTM E 1337.

SNUB

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

9. DEFINITIONS...Continued**STOPPING DISTANCE**

The distance traveled by a vehicle from the start of the brake application to the point where the vehicle stops.

TRAILER CONVERTER DOLLY

A trailer chassis equipped with one or more axles, the lower half of a fifth wheel and a drawbar.

TRUCK

A vehicle with motive power designed primarily for transportation of property or special purpose equipment.

TRUCK TRACTOR

A truck designed primarily for towing other vehicles and not so constructed as to carry a load other than a part of weight of vehicle and the load so drawn.

UNLOADED VEHICLE WEIGHT (UVW)

The weight of vehicle with maximum capacity of all fluids necessary for operation of the vehicle, but without cargo, occupants, or accessories that are ordinarily removed from the vehicle when they are not in use.

VEHICLE COMBINATION WEIGHT (VCW)

The combined weight of the towing vehicle and the vehicle being towed.

WHEEL LOCKUP

100% wheel slip.

10. TEST EXECUTION

10.1 VERIFICATION OF REQUIRED EQUIPMENT - Visual Inspections

A. Brake Distribution (S5.1.8, S5.2.2)

Verify that all wheels of the vehicle are equipped with service brakes.

B. Automatic Brake Adjustment (S5.1.8, S5.2.2)

Check that all brakes are equipped with automatic brake adjusters, and if equipped with adjustment indicators, that the indicators are visible from a location adjacent to or underneath the vehicle.

C. Antilock Brake System (S5.1.6.1, S5.2.3.1)

(1) For truck tractors manufactured after March 1, 1997;

(a) Verify that the vehicle is equipped with an ABS system.

(b) Verify that the wheels of at least one front and one rear axle are directly controlled and that the wheels of at least one axle are independently controlled.*

(2) For trucks and buses manufactured after March 1, 1998:

(a) Verify that the vehicle is equipped with an ABS system.

(b) Verify that the wheels of at least one front and one rear axle are directly controlled by locating the wheel speed sensing device(s).*

(3) For trailers and trailer converter dollies manufactured after March 1, 1998, verify that the vehicle is equipped with an ABS system.

(4) For semi-trailers and trailer converter dollies, verify that the wheels of at least one axle are directly controlled by locating wheel speed sensing device(s).*

(5) For full trailers, verify that the wheels of at least one front and one rear axle are directly controlled by locating wheel speed sensing device(s).*

*NOTE – The NHTSA COTR shall provide Contractor with technical data from the manufacturer that will be used to assist the Contractor in verifying the above.

10. TEST EXECUTION....Continued**D. Antilock Malfunction Warning Signal (S5.1.6.2, S5.2.3.2, S5.2.3.3, S5.5.1)**

- (1) For truck tractors manufactured after March 1, 1997 and for trucks and buses manufactured after March 1, 1998:
 - (a) Turn ignition to "On" or "Run" position and check for activation followed by deactivation of the visual signal after ignition is turned on.
 - (b) Verify that the visible warning signal is in the driver's forward field of view.
 - (c) Verify that the vehicle is equipped with an electrical circuit that provides continuous power to the antilock system(s) on any towed vehicles whenever the ignition switch is in the "On" or "Run" position*.
- (2) For truck tractors and single unit vehicles designed to tow another air-braked vehicle manufactured after March 1, 2001
 - (a) Turn ignition to "On" or "Run" position and check for activation followed by deactivation of the visual signal for the trailer ABS after ignition is turned on.
 - (b) Check that the visible warning signal is in the driver's forward field of view.
 - (c) Verify that the vehicle is equipped with a circuit that is capable of transmitting a malfunction signal from the antilock system(s) on any towed vehicles*.
- (3) For trailers and trailer converter dollies manufactured after March 1, 1998 but before March 1, 2009;

Verify that the vehicle is equipped with an external warning indicator lamp and check for activation followed by deactivation of the warning indicator after power is supplied to the ABS system.

*NOTE – The NHTSA COTR shall provide Contractor with technical data from the manufacturer that will be used to assist the Contractor in verifying the above.

10. TEST EXECUTION....Continued

- E. Service Reservoir Check (S5.1.2, S5.1.2.4, S5.2.1)
- (1) Truck tractors, trucks, and buses
 - (a) Visually check for one or more service reservoir systems.
 - (b) Visually check for an automatic condensate drain valve for each service reservoir, or a supply reservoir between the service system and the air pressure source.
 - (c) Visually check for automatic operation of condensate valve, if present, in accordance with manufacturer's specifications.* Describe method of operation.
 - (d) Verify that all reservoirs have a drain valve that can be manually operated.
 - (2) Trailers
 - (a) Visually check for one or more reservoirs to which the air is delivered from the towing vehicle.
 - (b) Verify that all reservoirs have a drain valve that can be manually operated.
- F. Parking Brake System Control (S5.6.4)
- (1) Verify that parking brake control is separate from the service brake control.
 - (2) Verify that parking brake control is readily accessible to, and operable by, a person seated in the normal driving position.
 - (3) Check that the parking brake control is identified in a manner that specifies the method of operation.
 - (4) FOR TOWING VEHICLES - Connect vehicle to a trailer equipped with parking brakes. Operate the parking brake control. Verify that the trailer's parking brakes apply and release as a result of the operation of the parking brake control.

*NOTE – The NHTSA COTR shall provide Contractor with technical data from the manufacturer that will be used to assist the Contractor in verifying the above.

10. TEST EXECUTION....Continued

10.2 LABORATORY TESTS

- A. Service Reservoir Air Pressure Gauge Accuracy, Compressor Cut-in and Cut-out {Truck Tractors, Trucks, and Buses} (S5.1.1.1, S5.1.4)
- (1) While seated in the normal driving position and in a normal driving posture, verify that the service brake system air pressure gauge is readily visible.
 - (2) Install a calibrated pressure transducer (e.g., a test gauge) with a digital readout, as close as practicable to the service reservoir of the system to be tested. Check to assure that there are no leaks in the system.
 - (3) Exercise the test gauge at least 3 cycles over the entire range up to the compressor cut-out pressure before performing the actual measurement.
 - (4) Build pressure in reservoir system to compressor cut-out and record test gauge reading.
 - (5) Turn off vehicle engine.
 - (6) Open condensate drain valve in reservoir slightly to slowly decrease pressure. Record vehicle pressure gauge reading and test gauge reading at 20 psi decrements until the vehicle pressure gauge reaches 10 psi.
 - (7) Subtract vehicle pressure gauge readings from test gauge pressure readings at each interval. Verify that the vehicle pressure gauge error is less than or equal to $\pm 7\%$ of the compressor cut-out pressure recorded in (4). Record on data sheet.
 - (8) Re-pressurize reservoir system to compressor cut-out.
 - (9) With engine idling, open condensate drain valve in reservoir slightly to slowly decrease pressure.
 - (10) Record test gauge reading at compressor cut-in.
 - (11) Verify that compressor cut-in pressure is 100 psi or greater for trucks and 85 psi or greater for buses. Record on data sheet.

10. TEST EXECUTION....Continued

- (12) Repeat test with pressure transducer in other service reservoir system.
- B. Warning Signal -- Service Reservoir Air Pressure {Truck Tractors, Trucks, and Buses} (S5.1.5)
- (1) Install pressure transducers in each service reservoir
 - (2) With engine and ignition "Off", bleed service brake system pressure below 60 psi
 - (3) Turn ignition to "On" or "Run" and check activation of the visible signal and activation of the audible signal if installed.
 - (4) While seated in the normal driving position, verify that the warning signal is visible within the driver's forward field of view.
 - (5) Start engine and allow the service brake reservoir system pressure to build to compressor cut-out. As the reservoir system pressure rises, verify the deactivation of the visible signal, and if installed, the deactivation of the audible signal at some pressure above 60 psi.
 - (6) Turn off vehicle engine.
 - (7) After engine rotation has stopped, and prior to the service brake reservoir pressure falling to 60 psi, turn ignition to "On" or "Run".
 - (8) Slowly bleed the service brake reservoir system pressure. As the air pressure falls, verify the activation of the visible signal and, if installed, the activation of the audible signal. Record pressure at activation.
- C. Service Brake Stop Lamp Switch Actuation {Truck Tractors, Trucks, and Buses} (S5.1.7)
- (1) Install a transducer to measure service brake chamber air pressure in the chamber closest to the service brake control.
 - (2) Install instrumentation that is capable of detecting when the stop lamps are energized.

10. TEST EXECUTION....Continued

- (3) Slowly depress the service brake control.
- (4) Determine the pressure at which stop-lights were energized. Record pressure.
- (5) Repeat determination while depressing the control rapidly.
- (6) Verify that the lamp actuates at a pressure of 6 psi or less. Record on data sheet.

D. Compressor Recharge Rate {Truck Tractors, Trucks, and Buses} (S5.1.1)

- (1) Set the parking brakes. Place calibrated transducers in the service reservoirs and pressurize the system to cut-out pressure.
- (2) Turn off any air-operated accessories. Lower the air pressure in the system to 70 psi or less.
- (3) Operate engine at vehicle manufacturer's maximum recommended RPM (fully depress accelerator). Towing vehicles are not placed in the towing position.
- (4) Determine the time necessary to increase the reservoir pressure from 85 psi to 100 psi.
- (5) Repeat tests two additional times.
- (6) Determine and record average of the three time measurements.
- (7) Calculate the Required Reservoir Capacity by multiplying twelve (12) times the combined volume of the brake chambers.
- (8) Determine the Actual Reservoir Capacity from the Reservoir Volume Test (Section E.)
- (9) Verify that average time to increase the air pressure in the reservoirs is less than or equal to:

$$\frac{\text{Actual Reservoir Capacity} \times 25}{\text{Required Reservoir Capacity}}$$

10. TEST EXECUTION....Continued**E. Reservoir Volume (S5.1.2.1, S5.2.1.1)**

- (1) Determine the volume of one of each type of reservoir as follows;
 - (a) Fill the reservoir completely with water at 100 psi and weigh.
 - (b) Empty the water and weigh again. Take care that all water is removed
 - (c) Determine the volume of the reservoir (27.7 cubic inches per pound).
- (2) Record identification numbers.
- (3) Based on the number of each type of reservoir, determine the total reservoir volume.
- (4) Determine the volume of at least one of each type or size of brake chamber using the table in Data Sheet No. 5 if possible. If not, determine the volume as follows;
 - (a) Fill the brake chamber with water at a pressure of 100 psi and weigh.
 - (b) Completely empty the brake chamber of water.
 - (c) Determine the volume of the brake chamber.
- (5) Record identification numbers.
- (6) Based on number of each type of chamber, determine the total chamber volume.
- (7) Determine the ratio of total reservoir volume to total chamber volume.
- (8) Verify the following;
 - (a) For truck tractors, trucks, and buses, the ratio of total reservoir volume to total chamber volume shall be equal to or greater than 12.
 - (b) For trailers, the ratio of total reservoir volume to total chamber volume shall be equal to or greater than 8.

10. TEST EXECUTION....Continued

F. Service Reservoir Hydrostatic Test (S5.1.2.2, S5.2.1.2)

NOTE: Since this test is potentially a destructive test, proper safety precautions should be observed. Consult the COTR for disposition of test reservoirs. Proper shielding of the test reservoir is recommended in the event the reservoir should rupture during the test. Under no circumstances should the tested reservoirs be placed in service on a vehicle.

At least one of each reservoir size and type not identified by the same part number will be tested. If the reservoir has multiple compartments, all compartments will be pressurized at the same time.

- (1) Determination of test pressure.
 - (a) For truck tractors, trucks and buses:
 - (i) Determine the compressor cut-out pressure
 - (ii) If compressor cut-out pressure times 5 is greater than 500 psi, use this pressure for tests. Otherwise, use 500 psi.
 - (b) For trailers and converter dollies use 500 psi.
- (2) Record part number.
- (3) Measure the reservoir circumference at a minimum of three locations along the longitudinal axis of the reservoir tank.
- (4) Hydrostatically pressurize reservoir at an average pressurization rate between 1 psi/sec and 5 psi/sec until test pressure is reached or reservoir is ruptured.
- (5) Maintain test pressure for 10 minutes, then relieve pressure.
- (6) Measure reservoir circumference at the same three locations defined previously.

10. TEST EXECUTION....Continued

- (7) Record any increase in circumference, evidence of stress, leaks, rupture, or loss of pressure.
 - (8) Verify whether permanent circumferential deformation exceeds 1% or pressure loss exceeds 5 psi.
- G. Service Reservoir System Air Loss Test (S5.1.2.3, S5.2.1.4)
- (1) Locate check valve or equivalent devices that protect reservoirs from air loss.
 - (2) Fully charge air reservoir system
 - (a) For truck tractors, trucks and buses, charge system to compressor cut-out pressure
 - (b) For trailers, charge system to 100 psi
 - (3) Record pressure in each service reservoir system
 - (4) Check for proper functioning of the check valve or equivalent device
 - (a) For Truck tractors, trucks, and buses, follow the manufacturer's recommendation for checking the check valve or equivalent device for proper function without disconnecting any air line or fitting. Describe method and technique used.
 - (b) For Trailers, disconnect the supply line coupling.
 - (5) Record pressure in each service reservoir system after 10 minutes.
 - (6) Verify that the pressure drop is less than or equal to 10 psi after 10 minutes.
- H. Towing Vehicle Protection System {Vehicles Designed to Tow Another Air Braked Vehicle} (S5.1.3)
- (1) Connect vehicle to a trailer.
 - (2) Open condensate drain valves until all reservoirs are empty.

10. TEST EXECUTION....Continued

- (3) Install pressure transducers in the service reservoirs of the towing vehicle and the trailer.
- (4) Start engine and allow air pressure to build up to the compressor cut-out pressure. Record this value.
- (5) Fully open a condensate drain valve(s) in the trailer's service reservoir(s). Record towing vehicle pressure as pressure in the trailer's reservoirs drop.

I. Brake Actuation and Release Timing (S5.3.3, S5.3.4)

- (1) For vehicles designed to tow another vehicle equipped with air brakes, install a 50 in³ reservoir connected to the rear control line coupling.
- (2) For vehicles equipped with an antilock system, provide power to the antilock system.
- (3) Install a pressure transducer at the brake chamber under test. All plumbing associated with this installation should be as short as possible. Restrictions, sharp bends in lines, or any plumbing techniques that cause unnecessary changes in the flow path of the air to the pressure sensor must be avoided. After the pressure transducer has been installed, a leak check should be performed and all leaks corrected.
- (4) Pressurize system to a reservoir pressure of 100 psi
- (5) Measure apply and release times for at least one chamber on each axle and, for vehicles designed to tow another vehicle equipped with air brakes, for the 50 in³ reservoir.
 - (a) For truck tractors, trucks, and buses
 - (i) Install a device to detect the first movement of the test vehicle brake control in such a manner that its operation does not affect the operation of the brake control.

10. TEST EXECUTION....Continued

- (ii) Depress service brake control as rapidly as practical with operator's foot and measure time from first movement of the brake control until the brake chamber pressure reaches 60 psi.
 - (iii) Continue to hold the brake control until the chamber reaches 95 psi.
 - (iv) Once the pressure in the chamber has achieved 95 psi, release brake control as rapidly as practical and measure time from the first movement of the brake control until the brake chamber pressure drops to 5 psi.
- (b) For trailers and converter dollies:
- (i) Connect supply and control couplings to trailer test rig shown in Figure 1.
 - (ii) Apply service brakes and measure time from first movement of the brake control valve until the chamber pressure reaches 60 psi.
 - (iii) Continue to apply the brake until the chamber reaches 95 psi.
 - (iv) Once the pressure in the chamber has achieved 95 psi, release service brakes and measure time from first movement of the brake control valve until the chamber pressure drops to 5 psi. Refer to Figure 2.
- (c) Repeat application and release an additional two times, ensuring the reservoirs are completely recharged per (d) between applications.

10. TEST EXECUTION...Continued

Figure 1

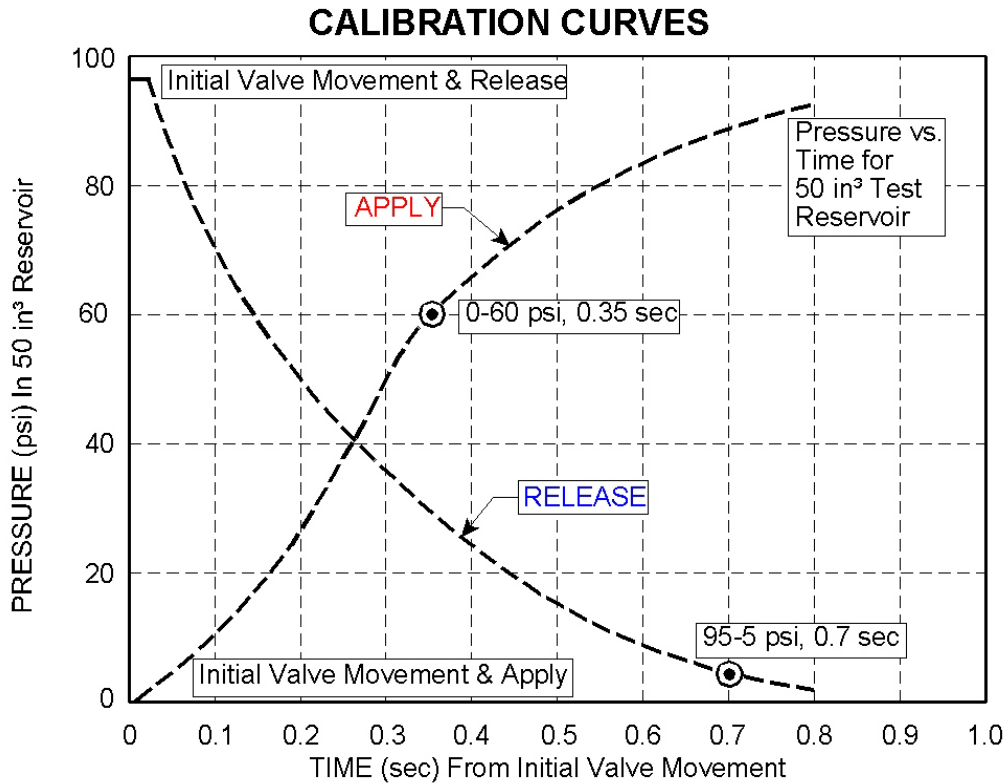
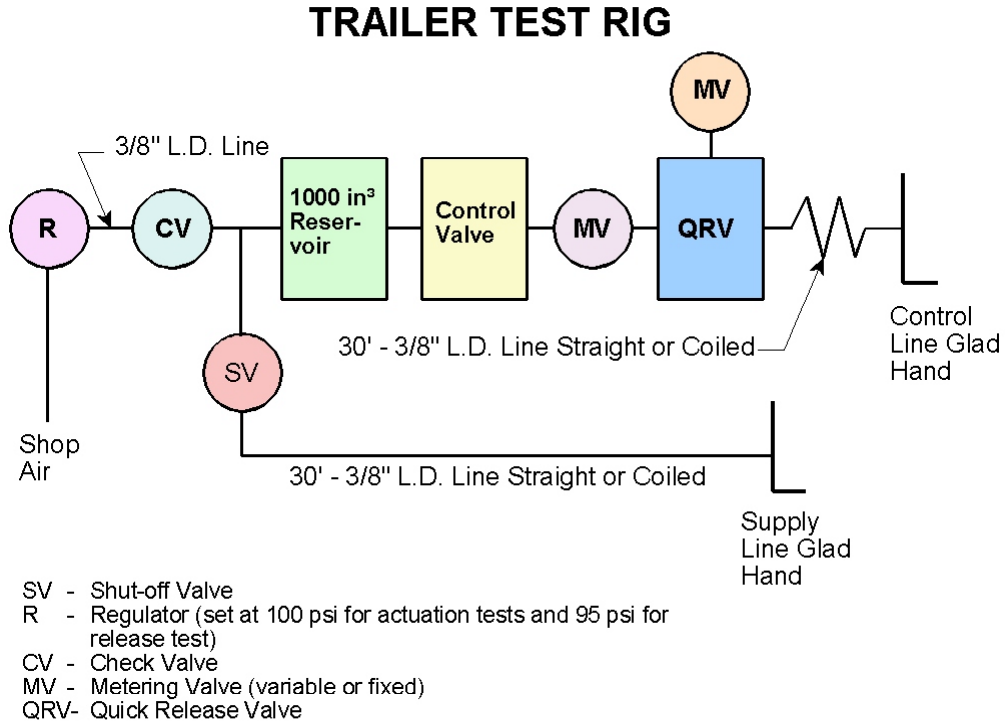


Figure 2

10. TEST EXECUTION...Continued

- (6) If the test vehicle is equipped with an antilock system, it shall also be tested under each of the following conditions (test to be performed not less than 10 seconds after inducing described conditions):
- (a) Without primary power to the antilock system.
 - (b) With the antilock control valve rendered inoperative by means of the wheel speed sensor open circuited and short circuited
- (7) Verify that the apply and release times are not more than the values in the chart below;

Brake Actuation and Release Times – Requirement

Vehicle Type	At the Brake Chamber		At the Control-line Gladhands w/50 cubic in reservoir	
	Apply	Release	Apply	Release
Truck and Buses Not Designed to Tow Another Vehicle	0.45 sec	0.55 sec	N/A	N/A
Truck Tractors and Single Units Designed to Tow Another Vehicle	0.45 sec	0.55 sec	Not later than the fastest brake chamber or not more than 0.35 sec*	0.75 sec
Trailers Not Designed to Tow Another Vehicle	0.50 sec	1.00 sec	N/A	N/A
Trailer Converter Dollies	0.55 sec	1.10 sec	Not later than the fastest brake chamber or not more than 0.55 sec*	1.10 sec
Trailers Designed to Tow Another Vehicle	0.60 sec	1.20 sec	Not later than the fastest brake chamber or not more than 0.50 sec*	1.00 sec

* - at the option of the manufacturer

10. TEST EXECUTION....Continued

- J. Control Signal Pressure Differential {Converter Dollies and Trailers Designed to Tow Another Vehicle Equipped with Air Brakes} (S5.3.5)
- (1) Insert a 0.032 inch thick disc with a fixed orifice of 0.0180 inch (no. 77 drill bit) in the control line between the trailer test rig coupling and the vehicle's control line input coupling. The trailer test rig is to be connected to an air source with the regulator set to 100 psi throughout test (see Figures 1 and 2).
 - (2) Connect a 50 in³ reservoir to the output control line coupling.
 - (3) Place a transducer in the 50 in³ reservoir and in the input control line coupling.
 - (4) Pressurize the system so that all reservoirs are at 100 psi.
 - (5) Apply vehicle brakes using trailer test rig until pressure in 50 in³ reservoir achieves 95 psi, then release brakes continuously recording pressures throughout the application and release.
 - (6) Requirement:

Verify the following:

The differential between the input and output pressure shall —
 - (a) Not exceed 1 psi for input pressures between 5 and 20 psi
 - (b) Not exceed 2 psi for input pressures between 20 and 40 psi
 - (c) Be between 0.95 times the input pressure and 1.05 times the input pressure for input pressures equal to or greater than 40 psi
- K. Parking Brake System Application and Holding (S5.6.3.2)
- (1) Induce loss of air pressure in service brake system(s) by opening a manual condensate drain valve.
 - (2) Verify that the parking brakes are held in the applied position solely by mechanical means. (Note: Use the manufacturer's technical data provided by the COTR).

10. TEST EXECUTION....Continued

- L. Parking Brake Accumulation of Actuation Energy (S5.6.6)
- (1) Jack a wheel that has a brake equipped with a parking brake off of the floor so that the wheel may be turned by hand.
 - (2) If the vehicle is designed to tow another vehicle equipped with air brakes, connect a 50 in³ reservoir to the rear supply line coupling.
 - (3) Pressurize reservoir system
 - (a) For trucks, truck tractors, and buses, build air pressure in the system until the reservoir system pressure is above 100 psi, then turn engine off.
 - (b) For trailers use the supply line portion of the trailer test rig (see Figures 1 and 2) to pressurize the supply line to 100 psi.
 - (4) Induce loss of air pressure in service brake system by opening a manual condensate valve in one service reservoir.
 - (5) Apply parking brake
 - (a) For trucks, truck tractors, and buses, actuate the parking brake control.
 - (b) For trailers, vent the front supply line coupling to atmosphere.
 - (6) Verify that the parking brakes have applied by confirming that the wheel is no longer free to rotate.
 - (7) Thirty (30) seconds after initiation of the parking brake application, release parking brake.
 - (8) Verify that the parking brakes have released by noting that the wheel is free to rotate.
 - (9) Thirty (30) seconds after initiation of parking brake release, reapply the parking brake.
 - (10) Verify that the parking brakes have applied by confirming that the wheel is no longer free to rotate.
 - (11) Fail other reservoir and repeat test.

10. TEST EXECUTION....Continued

- M. Modulated Emergency Braking System {Truck Tractors, Trucks, and Buses} (S5.7.2, S5.7.3(c))
- (1) Start engine and allow the service brake reservoir system pressure to build to compressor cut-out pressure.
 - (2) With engine "off", open condensate valve on one of the service reservoirs until pressure in that reservoir reaches zero.
 - (3) Apply and release the service brake control and verify that the emergency brakes apply and release.
 - (4) For vehicles designed to tow another air braked vehicle - Monitor the pressure at the control and supply line couplings to verify that the brakes on any towed vehicle equipped with air brakes apply and release with the service brake control. Record on data sheet.
 - (5) Fail other service reservoir and repeat test.
- N. Emergency Braking System {Trailer Converter Dolly} (S5.8.1(b))
- (1) Verify that the trailer converter dolly has a parking brake system.
 - (2) If it does not have a parking brake system;
 - (a) Pressurize the reservoirs to 20 psi.
 - (b) Vent the supply line coupling to atmosphere.
 - (c) Verify that the service brakes apply.
- O. Parking Brake System Automatic Application {Trailers} (S5.8.3)
- (1) Jack a wheel that has a brake equipped with a parking brake off of the floor so that the wheel may be turned by hand.
 - (2) If trailer is designed to tow a vehicle equipped with air brakes, install a 50 in³ reservoir to the rear supply line coupling.
 - (3) Install a pressure transducer or gauge in the front supply line coupling.
 - (4) Install a pressure regulator between the air source and the front supply line coupling.

10. TEST EXECUTION....Continued

- (5) Pressurize the supply line and allow the reservoir pressure to build to, and stabilize at, 100 psi.
- (6) Set the pressure regulator at 70 psi.
- (7) Induce loss of air pressure in service brake system(s) by opening a manual condensate drain valve in one service reservoir.
- (8) Verify that the wheel is free to rotate for all pressures above 70 psi in the supply line.

10. TEST EXECUTION....Continued

10.3 ROAD TESTS

A. General Test Conditions

- (1) Ambient air temperature must be between 32 °and 100° F.
- (2) Wind velocity shall not exceed 15 mph. Stops must not be made with a tail wind component in excess of 5 mph.
- (3) All vehicle openings (doors, windows, hood, etc.) must be closed except as required for instrumentation purposes.
- (4) Unless otherwise specified, the brake control can be applied and modulated at any desired rate.
- (5) For truck tractor tests that utilize the control trailer, a 50 in³ reservoir shall be attached to the tractors control gladhand. Tractor protection valve to be in the bobtail position for bobtail tests and the towing position for towing the control trailer
- (6) Except for the parking brake grade holding test, the roadway shall be flat with no more than a 1% grade in all directions including crown.
- (7) Tires must be inflated to the maximum cold pressure specified by the vehicle manufacturer for the gross vehicle weight rating.
- (8) The IBT must be between 150EF and 200EF for each stability and control, service and emergency stop. Brake temperature just prior to any parking brake test must be between 150EF and 200EF. Warm brakes to the required temperature by making 40 to 20 mph snubs at 10 ft/sec².
- (9) Automatic adjusters must remain activated for the duration of the test.
- (10) Brakes may be adjusted, per the vehicle manufacturer's procedure, at specified points in the test sequence.
- (11) Individual brake lining temperatures should be less than 200EF when being adjusted or checked.

10. TEST EXECUTION....Continued

- (12) The air system reservoir pressure must be at compressor governor cut-out pressure (+0/-10 psi) within 0.2 miles before the beginning of any stability and control and service or emergency brake stop or just prior to any parking brake test.
- (13) Vehicles equipped with an interlocking axle system or front wheel drive system capable of being manually engaged by the driver, shall be tested with the system disengaged.
- (14) The driver may steer as necessary to stay within the lane.
- (15) Vehicle speed is to be +0, -2 mph of the specified test speed.

B. Test Sequence (S5.3.1)**TRUCK TRACTORS**

- (1) Burnish
- (2) Stability and control test at GVWR
- (3) Stability and control test at LLVW
- (4) Manual brake adjustment allowed
- (5) Service brake stopping distance test at GVWR
- (6) Parking brake test at GVWR
- (7) Manual brake adjustment allowed
- (8) Service brake stopping distance tests at LLVW
- (9) Emergency brake stopping distance tests at LLVW
- (10) Parking brake test at LLVW
- (11) Final Inspection

10. TEST EXECUTION....Continued

TRUCKS AND BUSES

- (1) Burnish
- (2) Service brake stopping distance tests at GVWR
- (3) Emergency brake stopping distance tests at GVWR
- (4) Parking brake test at GVWR
- (5) Stability and Control at LLVW
- (6) Manual brake adjustment allowed
- (7) Service brake stopping distance tests at LLVW
- (8) Emergency brake stopping distance tests at LLVW
 - (a) Primary reservoir failure
 - (b) Secondary reservoir failure
 - (c) Primary control line failure
- (9) Parking brake test at LLVW
- (10) Final Inspection

C. Burnish (S6.1.8)

- (1) Road conditions should be dry. Slightly wet is permissible but discontinue burnish when noticeable splash and spray occurs.
- (2) Install brake lining thermocouples (see Figure 3).
- (3) Install thermocouple readout, decelerometer, and velocity measurement device.

10. TEST EXECUTION...Continued

- (4) Load vehicle to GVWR so that wheels do not lock during burnish snubs. Truck tractors shall be loaded by coupling to a control trailer. The vehicle combination weight shall equal the GVWR of the truck tractor. The ballast on the control trailer shall be located so that the truck tractor's wheels do not lock during burnish snubs. For safety, a roll bar structure less than 1,000 lb may be added to the vehicle.
- (5) Adjust brakes per the vehicle manufacturer's recommendation.
- (6) Burnish the brakes by making 500 snubs between 40 mph and 20 mph.
 - (a) Maintain a deceleration rate of 10 ft/sec², or at the vehicle's maximum deceleration rate if less than 10 ft/sec², with transmission in gear appropriate for speed. (If provided, manual retarders should be in off position.)
 - (b) Except where an adjustment is indicated, after each brake application accelerate to 40 mph and maintain that speed until making the next brake application at a point 1 mile from the initial point of the previous brake application. If the vehicle cannot attain a speed of 40 mph in 1 mile, continue to accelerate until the vehicle reaches 40 mph or until the vehicle has traveled 1.5 miles from the initial point of the previous brake application, whichever occurs first.
- (7) The brakes may be adjusted, as specified by the vehicle manufacturer, up to three times during the burnish procedure.
- (8) Driver Breaks
 - (a) Driver breaks during the procedure should be minimized and recorded on the data sheets.
 - (b) Driver breaks should not occur within any 25 snub sequence.
 - (c) Each 25th snub can be a complete stop in order to record data.

10. TEST EXECUTION....Continued

(9) Test Data Recording

Brake lining temperatures and brake application pressure to maintain a 10 ft/sec^2 deceleration should be recorded at each 25th brake snub.

- (10) Adjust brakes at the conclusion of the burnishing in accordance with the vehicle manufacturer's recommendation. Record adjustment data on data sheets.

D. Stability and Control (S5.3.6)

(1) Test Track

- (a) Install vertical markers (such as cones) on a 20 ft spacing with the inside edge of the markers placed on the 12 ft wide lane boundaries.
- (b) Begin water delivery to ensure a wet surface during the test.

(2) Instrumentation and equipment

- (a) Adjust vehicle weight to appropriate load condition as per test sequence. For the lightly loaded tests, an additional 1000 lb can be allotted for vehicles that require a roll bar.
- (b) Install fifth wheel or other velocity measurement device.
- (c) Install trigger switch to measure (detect) start of braking (first brake control movement).
- (d) Install a pressure transducer to measure brake primary control line pressure or device to measure full displacement of brake control.
- (e) Install recording device to record start of braking and primary control line pressure (or full brake control displacement) as a function of time.

10. TEST EXECUTION....Continued

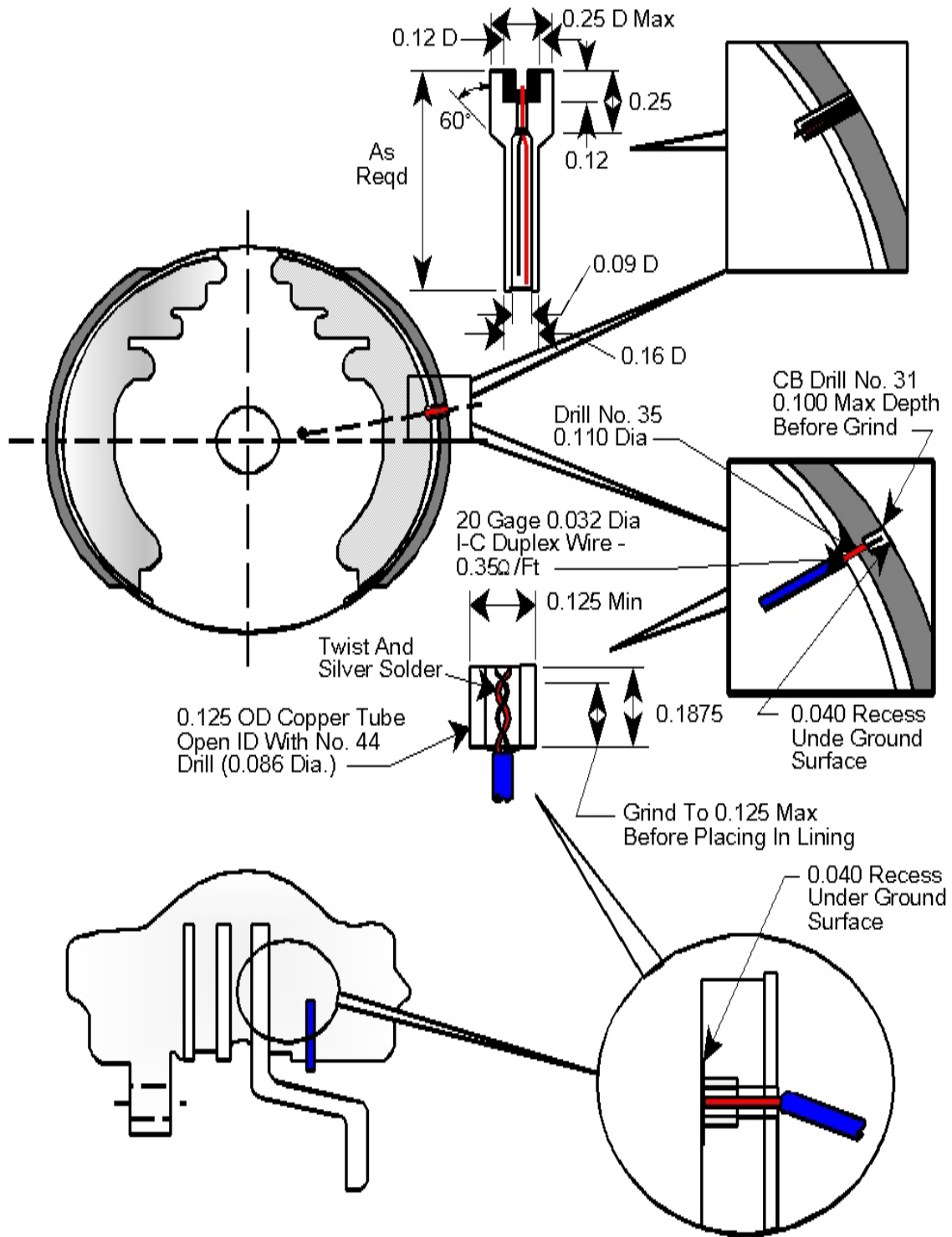
- (3) Maximum drive-through speed and braking speed determination
 - (a) Starting with the vehicle in the center of the lane, attempt to drive through the curved 500 ft radius test lane at a constant speed.
 - (b) Increase or decrease speed in subsequent runs as necessary until the maximum drive-through speed is determined to the nearest whole mph increment. Do not exceed 40 mph.
 - (c) Verify maximum drive-through speed at least once by repeating runs at 1 mph above the previously determined value.
 - (d) Take 75% of the maximum drive-through speed and round this value to the nearest whole mph increment to determine test speed for braking runs
- (4) Braking Runs
 - (a) Starting with the vehicle in the center of the lane, make four full brake application stops from the test speed determined in the previous step.
 - (b) Make the brake applications after the front end of the vehicle has traveled at least 60 ft in the curved lane on the test surface.
 - (c) Vehicle speed at which the brakes are applied should be within -1.0 to +0.5 mph of the test speed.
- (5) Requirement

Verify that the vehicle remained within the 12-foot lane without any part of the vehicle leaving the roadway in at least three of the four runs. Record on data sheet.

10. TEST EXECUTION...Continued

Figure 3

TYPICAL PLUG TYPE THERMOCOUPLE INSTALLATION



10. TEST EXECUTION....Continued

E. Service Brake Stopping Distance Test (S5.3.1.1)

(1) Instrumentation and Equipment

- (a) Install device to measure or monitor individual wheel lock-up.
- (b) Install pressure gauge/transducer to measure brake control line pressure.
- (c) Install device to measure speed at first movement of brake control and distance from first movement of brake control until vehicle stops.
- (d) Install instrumentation to display brake temperatures to driver.
- (e) Adjust vehicle weight to appropriate load condition as per test sequence.

(2) Braking Runs

Conduct six stops from 60 mph trying to achieve the shortest stopping distance while maintaining the vehicle within the lane. If the speed attainable in 2 miles is less than 60 mph, the stops will be made from a speed that is a multiple of 5, which is 4 to 8 mph less than the speed attainable in 2 miles.

(3) Wheel Lockup Provisions

- (a) At vehicle speeds above 20 mph, any wheel on a non-steerable axle other than the two rearmost non-liftable, non-steerable axles may lock up for any duration.
- (b) At vehicle speeds above 20 mph, one wheel on any axle or two wheels on any tandem may lock up for any duration.

10. TEST EXECUTION....Continued

- (c) At vehicle speeds above 20 mph, any wheel not permitted to lock above in (A) or (B) may lock up repeatedly, with each lockup occurring for a duration of 1 second or less.
- (d) At vehicle speeds of 20 mph or less, any wheels may lock up for any duration.

(4) Requirement

Verify that the stopping distance for at least one stop shall be not more than the distance specified in the appropriate column of Table 1.

F. Emergency Brake Stopping Distance Test (S5.7.1)

(1) Instrumentation and Equipment

- (a) Install a solenoid valve in largest port in the appropriate air reservoir.
- (b) Install a pressure gauge/transducer to measure brake control line pressure.

(2) Conduct 6 stops from 60 mph while trying to achieve the shortest stopping distance while maintaining the vehicle in the lane. If the vehicle speed attainable in 2 miles is less than 60 mph, the vehicle shall stop from a speed that is a multiple 5 mph between 20 and 60 mph, which is 4 to 8 mph less than the speed attainable in 2 miles.

- (a) Activate the solenoid valve to vent pressure to atmosphere.
- (b) Initiate the stop within 5 seconds after the low pressure warning is activated.

(3) Repeat for the other reservoir system.

(4) Repeat with the solenoid in the trailer supply line and the trailer control line vented to atmosphere for trucks other than truck tractors that are also towing vehicles (GVWR only).

10. TEST EXECUTION....Continued

- (6) Repeat with the control line to the rear vented to atmosphere at the brake control valve.
- (7) Requirement

Verify that the stopping distance for at least one stop shall be not more than the distance specified in the appropriate column of Table 1.

TABLE 1
STOPPING DISTANCE REQUIREMENTS

Vehicle Speed (mph)	Service Brake Stopping Distance				Emergency Brake Stopping Distance	
	Loaded and Unloaded Busses	Loaded Single Unit Trucks	Unloaded Truck Tractors and Single Unit Trucks	Loaded Truck Tractors	All Vehicles Except Truck Tractors	Unloaded Truck Tractors
20	32	35	38	40	83	85
25	49	54	59	62	123	131
30	70	78	84	89	170	186
35	96	106	114	121	225	250
40	125	138	149	158	288	325
45	158	175	189	200	358	409
50	195	216	233	247	435	504
55	236	261	281	299	520	608
60	280	310	335	355	613	720

10. TEST EXECUTION....Continued

G. Parking Brake Chamber Application Pressure

- (1) Determine the parking brake chamber application pressure.
- (2) Install pressure transducers in parking brake chambers.
- (3) Install a device to indicate the first movement of parking brake control.
- (4) For vehicles designed to tow a vehicle equipped with air brakes, install a 50 in³ reservoir to the rear supply line coupling.
- (5) Pressurize reservoirs to 100 psi.
- (6) Actuate the parking brake control and record the pressure at the parking brake chambers three seconds after actuation of control.
- (7) Use the parking brake chamber pressure recorded after three seconds in the appropriate parking brake test (static retardation force or grade holding). If the pressure after three seconds is less than or equal to 3 psi, use a pressure of 0 psi.

H. Static Retardation Force Test (S5.6.1)

- (1) Install a pull device, load cell, and wheel rotation measurement device.
- (2) If the parking brake chamber pressure was greater than 3 psi, install a pressure regulator and a method of supplying air at the recorded pressure to the parking brake chambers to be tested.
- (3) Position the vehicle on a level dry Portland cement concrete or equivalent surface in line with the pull cable.
- (4) Connect the pull cable so that the cable is level within ± 5 degrees.
- (5) Mark the tires on braked wheels at the point of tire/ground contact and at 90, 180, and 270 degrees from that point.
- (6) Disable the parking brake chambers on axle(s) other than the axle being tested.

10. TEST EXECUTION....Continued

- (7) Throughout the sequence, warm the brakes as necessary to achieve the specified IBT.
- (8) Place vehicle transmission in neutral.
- (9) Charge the brake system reservoirs to compressor governor cut-out pressure.
- (10) Turn engine off.
- (11) Apply parking brakes.
- (12) Pull vehicle forward at a maximum rate of 4 ft/min until the wheel rotates 90 degrees. Release parking brakes.
- (13) Repeat steps (8) through (12) starting from 90, 180, and 270 degrees of wheel rotation.
- (14) Repeat (8) through (13) except pull the vehicle in the rearward direction.
- (15) Record peak pull force for each 90 degrees of wheel rotation.
- (16) Requirement
 - (A) For vehicles other than a truck tractor that is equipped with more than two axles, the quotient —

$$\frac{\text{Static Retardation Force}}{\text{GAWR}}$$

shall not be less than 0.28 for any axle other than a steerable front axle.

- (B) For truck tractors equipped with more than two axles, the quotient —

$$\frac{\text{StaticRetardationForce}}{\text{GVWR}}$$

shall not be less than 0.14.

10. TEST EXECUTION....Continued

I. Grade Holding Test (S5.6.2)

NOTE: The weight of the truck-tractor/test trailer combination (GCW) is GREATER than the tractor GVWR. If the combination will not park on the test grade at the GCW, reduce the weight to equal truck-tractor GVWR and retest.

- (1) Install a device to measure vehicle movement on the grade.
- (2) If the parking brake chamber pressure was greater than 3 psi, install a pressure regulator and a method of supplying air at the recorded pressure to the parking brake chambers to be tested.
- (3) Warm brakes, as necessary, to achieve specified IBT.
- (4) Charge brake system reservoirs to compressor governor cut-out pressure.
- (5) Ascend 20% grade (+0%,-1%) of dry smooth Portland cement concrete or equivalent surface.
- (6) Apply and hold service brakes to the minimum level necessary to hold vehicle stationary.
- (7) Place vehicle transmission in neutral.
- (8) Turn engine off.
- (9) Apply parking brakes.
- (10) Release service brakes.
- (11) Record initial movement of vehicle, if any, that takes place after release of service brakes until vehicle becomes stationary.
- (12) Record vehicle movement, if any, on grade after 5 minutes.
- (13) Repeat the test with the vehicle descending the grade.

10. TEST EXECUTION....Continued

- J. For Vehicles with a Common Diaphragm (S5.6.7)
- (1) Install instrumentation necessary for appropriate parking brake test (i.e., static retardation force or grade holding).
 - (2) Install pressure transducers at all service reservoirs.
 - (3) Install a tee in the air line supplying the brake chamber such that two legs of the tee connect the air supply with the chamber and the third leg is vented to the atmosphere through a metering valve.
 - (4) For vehicles designed to tow a vehicle equipped with air brakes, install a 50 in³ reservoir on the rear supply line.
 - (5) Set vehicle parking brakes and reduce pressures in all reservoirs to zero.
 - (6) Partially open the metering valve to induce a leak in the system.
 - (7) Attempt to release parking brakes.
 - (a) For truck tractors, trucks, and buses, run engine at idle and hold parking brake control in release position.
 - (b) For trailers, connect the trailer's front supply line coupling to the trailer test rig supply line coupling with the trailer test rig regulator set at 100 psi.
 - (8) Adjust leakage rate
 - (a) If parking brakes release, adjust metering valve to increase rate of leakage.
 - (b) If parking brakes do not release and the reservoir pressures have stabilized, adjust metering valve to decrease rate of leakage. Pressures can be considered stabilized if pressure change is less than 2 psi in one minute.
 - (9) Repeat (5) through (8) until maximum leak rate at which brakes can be released is established.
 - (10) Fully pressurize system (compressor cut-out for truck tractors, trucks, and buses; 100 psi for trailers)

10. TEST EXECUTION....Continued

- (11) Apply parking brakes and remove air source. Record reservoir pressures until pressures reach zero.
 - (a) For truck tractors, trucks, and buses, turn engine off and apply parking brake control.
 - (b) For trailers, vent front supply line coupling.
- (12) Determine and record leakage rate in psi per minute by dividing 90 by the number of minutes (measured to the nearest 0.01) that elapsed from the time the reservoir pressure was 95 psi until the reservoir pressure was 5 psi.
- (13) Adjust the metering valve to increase leakage rate. Repeat (10) through (12) until a leak rate of three times the level determined in step (9) has been established.
- (14) Without changing metering valve, conduct appropriate parking brake test (i.e., static retardation force or grade holding).

K. Final Inspection

- (1) Inspect brake system for structural integrity.
- (2) Verify that all brakes lines are connected and brakes operate.
- (3) Verify brake adjustment is within manufacturers limits.

11. REPORT

REPORT COVER PAGES FORMAT

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:

- (1) Final Report Number such as 121V-ABC-0X-001, where:

121 is the FMVSS tested ("V" denotes Vehicle road tests)
 ABC are the initials for the test laboratory
 0X is the Fiscal Year of the test program (of 9X before year 2000)
 001 is the Group Number (001 for the 1st test, 002 for the 2nd test, etc.)

- (2) Final Report Title And Subtitle such as:

SAFETY COMPLIANCE TESTING FOR FMVSS 121
 Air Brake Systems

Name of Vehicle Manufacturer
 Model Year, Make and Model of Vehicle
 NHTSA Vehicle No. or Test Number

- (3) Contractor's Name and Address such as:

COMPLIANCE TESTING LABORATORIES, INC.
 4335 West Dearborn Street
 Detroit, Michigan 48090

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

- (4) Date of Final Report completion
- (5) The words "FINAL REPORT"

11. REPORT....Continued

(6) 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 6111 (NVS-220)
Washington, DC 20590

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:

11. REPORT....Continued

SECOND PAGE AFTER FRONT COVER

A completed Technical Report Documentation Page (Form DOT F 1700.7) 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

121V-ABC-9X-001 or 121V-ABC-0X-001 (after year 1999)

Block 2 — GOVERNMENT ACCESSION NUMBER

Leave blank

Block 3 — RECIPIENT'S CATALOG NUMBER

Leave blank

Block 4 — TITLE AND SUBTITLE

Final Report of FMVSS 121 Compliance Testing of 200X Ace Truck,
NHTSA No. CX0701

Block 5 — REPORT DATE

March 1, 200X

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

Block 10 — WORK UNIT NUMBER

Leave blank

11. REPORT....Continued

Block 11 — CONTRACT OR GRANT NUMBER
DTNH22-0X-D-12345

Block 12 — SPONSORING AGENCY NAME AND ADDRESS
US Department of Transportation
National Highway Traffic Safety Administration
Office of Vehicle Safety Compliance
400 Seventh Street, SW
Mail Code: NVS-220, Room 6111
Washington, DC 20590

Block 13 — TYPE OF REPORT AND PERIOD COVERED
Final Test Report
Feb. 15 to Mar. 15, 200X

Block 14 — SPONSORING AGENCY CODE
NVS-220

Block 15 — SUPPLEMENTARY NOTES
Leave blank

Block 16 — ABSTRACT
Compliance tests were conducted on the subject axle assembly in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-121V-OX for the determination of FMVSS 121 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.

Block 17 — KEY WORDS
Compliance Testing
FMVSS 121

11. REPORT....Continued**Block 18 — DISTRIBUTION STATEMENT**

Copies of this report are available from —
NHTSA Technical Information Services (TIS)
Mail Code: NPO-230, Room 5108
400 Seventh Street, SW
Washington, DC 20590
Telephone No. (202) 366-4946

Block 19 — SECURITY CLASSIFICATION OF REPORT
Unclassified

Block 20 — SECURITY CLASSIFICATION OF PAGE
Unclassified

Block 21 — NUMBER OF PAGES
Add appropriate number

Block 22 — PRICE
Leave blank

12. DATA SHEETS

DATA SHEET No.1
VEHICLE INFORMATION DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/BodyType _____

VIN: _____

NHTSA NO.: _____ Build Date: _____

ENGINE DATA: Type: (Diesel, gas, other) _____
 _____ cylinders _____ CID _____ Liter _____ cc

TRANSMISSION: _____ speed _____ manual _____ automatic _____ overdrive

AXLE CONFIGURATION: _____

ODOMETER READING: _____ km (miles).

OPTIONS: _____

WHEELBASE mm (in): _____

AERODYNAMIC TREATMENTS: Yes _____ No _____

BRAKES:

Axles:	Type ¹	Size	Make	Lining (Edge Code)
1	_____	_____	_____	_____
2	_____	_____	_____	_____
3	_____	_____	_____	_____

¹ Cam, disc, wedge, etc.

12. DATA SHEETS ...Continued

BRAKE DRUM/ROTOR:

	Type ²	Make	Dust Shields Installed?
Axles:			
1	_____	_____	_____
2	_____	_____	_____
3	_____	_____	_____

² Cast or composite drum, vented or non-vented rotor, etc.

ACTUATION DETAILS:

Axles:	AIR CHAMBERS		SLACK ADJUSTERS	
	Make	Type ³	Length or Wedge angle Mfr	Cam Rotation ⁴
1	_____	_____	_____	_____
2	_____	_____	_____	_____
3	_____	_____	_____	_____

³ Size and diaphragm or piston

⁴ Same or opposite to forward wheel rotation

TIRES

Axles:	Pressure (psi)	Size	Make	Model	Static Loaded Radius	
					Measured	Databook
1	_____	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____	_____
3	_____	_____	_____	_____	_____	_____

REMARKS:

12. DATA SHEETSContinued

ABS:

Mfr: _____ Model: _____ Configuration: _____

FRONT SUSPENSION:

Type: _____ Make: _____ Model: _____

REAR SUSPENSION:

Type: _____ Make: _____ Model: _____

Rear Axle Spread, (in): _____ Overall Width (SAE J693): _____

FIFTH WHEEL:

Fifth Wheel Height Relative to Ground, mm (in): _____

Fifth Wheel Position, mm (in)⁵: _____⁵ Relative to rear axle(s) centerline (include sketch if necessary)

AIR SYSTEM:

Compressor Capacity (cfm): _____

Cut-out (psi): _____ Cut-in (psi): _____

Crack Pressure Ratings (psi)⁵: _____

1st Axle: _____ 2nd Axle: _____

3rd Axle: _____ Treadle Valve⁶: _____⁵ Relative to rear axle(s) centerline (include sketch if necessary)⁶ Total crack pressures between treadle valve and brake chambers

12. DATA SHEETS ...Continued

AIR TANK VOLUMES. (cu. in.):

Supply:_____ Primary:_____ Secondary:_____

Auxiliary:_____ Isolated From Service? Yes/No

TEST WEIGHTS (lbs):

	LLVW	Burnish	Fully Loaded (GVWR)
Axle:			
1	_____	_____	_____
2	_____	_____	_____
3	_____	_____	_____
Total:	_____	_____	_____
Control Trailer:	_____	_____	_____
Total: (truck tractor and control trailer)	_____	_____	_____

REMARKS:

12. DATA SHEETS.....Continued

DATA SHEET No. 2
VERIFICATION OF REQUIRED EQUIPMENT

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Technician: _____

SERVICE BRAKES

All Wheels Equipped with Brakes Yes No

All Brakes Equipped with Automatic Brake Adjusters Yes No

Brake Adjustment Indicators are visible from a location adjacent to or beneath the vehicle Yes No

ANTILOCK BRAKE SYSTEM

Antilock System Installed Yes No

Proper axle control Yes No

Comments:

Antilock Warning Signal within Drivers Field-of-View Yes No

SERVICE RESERVOIRS

No. of Reservoirs

Automatic Condensate drain valve(s) or supply reservoir Yes No

Automatic Operation of condensate drain valve Yes No

Each Reservoir has a Drain Valve which can be Manually Operated Yes No

PARKING BRAKES

Parking Brake Control Separate from Service Brake Control Yes No

12. DATA SHEETS....ContinuedDATA SHEET No. 2
VERIFICATION OF REQUIRED EQUIPMENT

Parking Brake Control Accessible from Operator's Seat Yes No

Parking Brake control is identified in a manner
that specifies its operation Yes No

Parking Brake Control Operates Parking Brakes
of Towed Vehicle N/A Yes No

REMARKS:

12. DATA SHEETSContinued

DATA SHEET No. 3
SERVICE RESERVOIR AIR PRESSURE GAUGE ACCURACY

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Technician: _____

SYSTEM 1

Compressor Cut-out: _____

7 % of Compressor Cut-out: _____

Compressor Cut-in: _____

Pressure Readings

Nominal Level	Test Gauge	Veh. Press. Gauge	Error
100			
80			
60			
40			
20			

REMARKS:

12. DATA SHEETSContinued

DATA SHEET No. 3
SERVICE RESERVOIR AIR PRESSURE GAUGE ACCURACY

SYSTEM 2

Compressor Cut-out: _____

7 % of Compressor Cut-out: _____

Compressor Cut-in: _____

Pressure Readings

Nominal Level	Test Gauge	Veh. Press. Gauge	Error
100			
80			
60			
40			
20			

AIR PRESSURE WARNING SIGNAL

Visible Signal within Drivers Field of View Yes No

Audible Signal Installed Yes No

Pressure when Signal Deactivates _____ psi

Pressure when Signal Activates _____psi

STOP LAMP

Pressure at Which Stop Lamp Activated:

Slow Brake Application _____ psi

Rapid Brake Application _____ psi

Both activation pressures are 6 psi or less Yes No

REMARKS:

12. DATA SHEETS ...Continued

**DATA SHEET No. 4
COMPRESSOR RECHARGE RATE**

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Technician: _____

COMPRESSOR RECHARGE RATE

	Time from 85 to 100 psi	
	Primary	Secondary
Run 1		
Run 2		
Run 3		
Avg		

Recharge rate meets requirement Yes No

REMARKS:

12. DATA SHEETS ...Continued

DATA SHEET No. 5
SERVICE RESERVOIR VOLUME TEST

Vehicle: _____ NHTSA Vehicle No.: _____
Date: _____ Technician: _____

SERVICE RESERVOIR VOLUME TEST

Reservoir Identification Number	Weight of Reservoir with Water (lb)	Weight of Reservoir without Water (lb)	Reservoir Volume (Weight of Water × 27.7)

BRAKE CHAMBERS

Chamber Identification Number	Weight of Chamber with Water (lb)	Weight of Chamber without Water (lb)	Chamber Volume (Weight of Water × 27.7)

Brake Chamber Rated Volumes

Type	Full Stroke (in)	Rated Volume (cu. In.)
9	1.75 – 2.10	25
12	1.75 – 2.10	30
14	2.25 – 2.70	40
16	2.25 – 2.70	46
18	2.25 – 2.70	50
20	2.25 – 2.70	54
24	2.50 – 3.20	67
30	2.50 – 3.20	89
36	3.00 – 3.60	135

Total Reservoir Volume _____

Total Chamber Volume _____

Ratio of Total Reservoir Volume to Total Chamber Volume _____

12. DATA SHEETS ...Continued

DATA SHEET No. 6
RESERVOIR CIRCUMFERENCE MEASUREMENTS

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Technician: _____

SERVICE RESERVOIR HYDROSTATIC TEST

Test Pressure = _____ psi

RESERVOIR CIRCUMFERENCE MEASUREMENTS

	Location 1	Location 2	Location 3
Before Pressure Applied			
After Pressure Applied			
Change (Percent)			

Initial Pressure _____ Final Pressure _____

Pressure Loss _____

REMARKS: (Note any leaks, ruptures, evidence of stress)

12. DATA SHEETSContinued

DATA SHEET No. 6
RESERVOIR AIR LOSS

Method of Inducing Failure:

Primary

Secondary

Pressure in Air System Prior to Inducing Failure

Pressure in Air System 10 minutes
After Inducing Failure_____

REMARKS:

12. DATA SHEETS...Continued

DATA SHEET No. 7
TOWING VEHICLE PROTECTION

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Technician: _____

TOWING VEHICLE PROTECTION

Trailer Reservoir Pressure	Towing Vehicle Primary Reservoir Pressure	Towing Vehicle Secondary Reservoir Pressure
100		
95		
90		
85		
80		
75		
70		
65		
60		
55		
50		
45		
40		
35		
30		
25		
20		
15		
10		
5		
0		

Pressure at which protection valve activates: _____ psi

12. DATA SHEETS ...Continued

**DATA SHEET No. 8
BRAKE ACTUATION AND RELEASE TIMES**

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Driver: _____ Technician: _____

BRAKE ACTUATION AND RELEASE TIMES

Run No.	Axle 1		Axle 2		Axle 3		50 in ³ Reservoir	
	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)
1								
2								
3								
Avg								

CONTROL SIGNAL PRESSURE DIFFERENTIAL

Maximum pressure difference between input coupling and 50 in³ reservoir:

for input pressures between 5 and 20 psi

for input pressures between 20 and 40 psi

for input pressures above 40 psi

REMARKS:

12. DATA SHEETS....Continued

DATA SHEET No. 9

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Driver: _____ Technician: _____

PARKING BRAKE AND EMERGENCY BRAKE OPERATION:

PARKING BRAKE APPLICATION AND HOLDING

Parking brakes held in place by mechanical means Yes No

PARKING BRAKE ACCUMULATION OF ENERGY

Parking brakes apply after release with leak Yes No

MODULATED EMERGENCY BRAKING SYSTEM
(Truck Tractors, Trucks, and Buses Only)

Emergency brakes modulated by service brake control Yes No

Trailer brakes modulated by service brake control N/A Yes No

EMERGENCY BRAKING SYSTEM
(Trailer Converter Dollies Only)

Does dolly have parking brakes Yes No

If no, do service brakes apply when supply line vented to atmosphere Yes No

PARKING BRAKE SYSTEM AUTOMATIC APPLICATION
(Trailers Only)

Parking brakes remain released for pressures above 70 psi Yes No

Parking brakes apply for pressures below 70 psi Yes No

REMARKS:

12. DATA SHEETS...Continued

DATA SHEET No. 10
BURNISH

Vehicle: _____ NHTSA Vehicle Number: _____

BURNISH TEST WEIGHT: AXLE 1: _____ AXLE 2: _____			
Driver No.	Date	Odometer Start	Odometer End
1			
2			
3			
4			

		ADJUSTMENT LEVELS Measured Stroke (in.)					
	SNUB	1L	1R	2L	2R	3L	3R
Initial	0						
1 st							
2 nd							
3 rd							
Final							

REMARKS:

12. DATA SHEETS...Continued

DATA SHEET No. 11
STABILITY & CONTROL

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Driver: _____ Technician: _____

GVWR LLVW

Maximum Drive Through Speed _____ mph

75% of Max Drive Through Speed _____ mph

Stop No.	Initial Speed (mph)	Apply Time (sec)	Approx. Dist. Out of Lane (ft)	Number Markers Hit	Comments
1					
2					
3					
4					

Ambient Temp.: _____ °F

Wind Speed: _____ mph

Direction: _____

REMARKS:

12. DATA SHEETS...Continued

DATA SHEET No. 12
SERVICE BRAKE STOPPING TEST

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Driver: _____ Observer: _____

BRAKE STROKE MEASUREMENTS at 85 psi (in)

Axle 1 Left/Right _____ /

Axle 2 Left/Right _____ /

Axle 3 Left/Right _____ /

GVWR LLVW

60 MPH OR – MPH SERVICE BRAKE STOPS

Stop	Application Pressure (psi)	Initial Speed (mph)	Actual Stopping Distance (feet)	Corrected Stopping Distance per SAE J299	In 12 foot Lane	Wheel Lock-up Indication	Comments
1							
2							
3							
4							
5							
6							

Ambient Temp.: _____ °F Wind Speed: _____ mph Direction: _____

12. DATA SHEETS....Continued

DATA SHEET No. 13

**PRIMARY RESERVOIR FAILURE
60 MPH OR--MPH EMERGENCY BRAKE STOPS**

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Driver: _____ Observer: _____

**PRIMARY RESERVOIR FAILURE
60 MPH OR--MPH EMERGENCY BRAKE STOPS**

Stop	Application Pressure (psi)	Initial Speed (mph)	Actual Stopping Distance (feet)	Corrected Stopping Distance per SAE J299	In 12 foot Lane	Wheel Lock-up Indication	Comments
1							
2							
3							
4							
5							
6							

Ambient Temp.: _____ °F

Wind Speed: _____ mph

Direction: _____

REMARKS:

12. DATA SHEETS....Continued

DATA SHEET No. 14

**SECONDARY RESERVOIR FAILURE
60 MPH OR--MPH SERVICE BRAKE STOPS**

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Driver: _____ Technician: _____

**SECONDARY RESERVOIR FAILURE
60 MPH OR--MPH SERVICE BRAKE STOPS**

Stop	Application Pressure (psi)	Initial Speed (mph)	Actual Stopping Distance (feet)	Corrected Stopping Distance per SAE J299	In 12 foot Lane	Wheel Lock-up Indication	Comments
1							
2							
3							
4							
5							
6							

Ambient Temp. _____ °F

Wind Speed: _____ mph

Direction: _____

REMARKS:

12. DATA SHEETS...Continued

DATA SHEET No. 15

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Driver: _____ Technician: _____

**PRIMARY CONTROL LINE FAILURE
60 MPH EMERGENCY BRAKE STOPS**

Stop	Application Pressure (psi)	Initial Speed (mph)	Actual Stopping Distance (feet)	Corrected Stopping Distance per SAE J299	In 12 foot Lane	Wheel Lock-up Indication	Comments
1							
2							
3							
4							
5							
6							

Ambient Temp: _____ °F

Wind Speed: _____ mph

Direction: _____

REMARKS:

12. DATA SHEETS...Continued

DATA SHEET No. 16

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Driver: _____ Technician: _____

**TRAILER CONTROL AND SUPPLY LINE FAILURE FOR TRUCK TRACTORS
60 MPH EMERGENCY BRAKE STOPS**

Stop	Application Pressure (psi)	Initial Speed (mph)	Actual Stopping Distance (feet)	Corrected Stopping Distance per SAE J299	In 12 foot Lane	Wheel Lock-up Indication	Comments
1							
2							
3							
4							
5							
6							

Ambient Temp.: _____ °F

Wind Speed: _____ mph

Direction: _____

REMARKS:

12. DATA SHEETS....Continued

DATA SHEET No. 17
PARKING BRAKE TEST

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Technician: _____

Parking Brake Chamber Application Pressure Determination

AXLE #

RUN NUMBER	PRESSURE IN PARKING CHAMBER AFTER 3 SECONDS (PSI)	
	LEFT	RIGHT
1		
2		
3		
AVERAGE		

If average pressure is less than or equal to 3 psi, use 0 psi

REMARKS:

12. DATA SHEETS...Continued

**DATA SHEET No.18
PARKING BRAKE TEST**

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Driver: _____ Technician: _____

Static Retardation Force

Parking Brake Chamber Pressure _____ psi

AXLE # _____ DRAWBAR PULL — PEAK FORCE DURING WHEEL ROTATION

Brake Temperature Before Forward Pull: _____ Before Reverse Pull: _____				
Pull Direction	0° - 90° Rotation	90° - 180° Rotation	180° - 270° Rotation	270° - 360° Rotation
FORWARD				
REVERSE				
Brake Temperature After Forward Pull: _____ After Reverse Pull: _____				

AXLE # _____ DRAWBAR PULL — PEAK FORCE DURING WHEEL ROTATION

Brake Temperature Before Forward Pull: _____ Before Reverse Pull: _____				
Pull Direction	0° - 90° Rotation	90° - 180° Rotation	180° - 270° Rotation	270° - 360° Rotation
FORWARD				
REVERSE				
Brake Temperature After Forward Pull: _____ After Reverse Pull: _____				

REMARKS:

12. DATA SHEETS....Continued

DATA SHEET No. 19
PARKING BRAKE TEST

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Driver: _____ Technician: _____

Grade Holding

GVWR

LLVW

Parking Brake Chamber Pressure _____ psi

<input type="checkbox"/> GVWR <input type="checkbox"/> LLVW	Initial Brake Temperature (°F)	Control Pressure to Hold Vehicle (psi)	Movement to Become Stationary on Grade (inches)	Stationary on Grade for 5 minutes	
				Yes	No
Up Grade					
Down Grade					

REMARKS:

12. DATA SHEETS...Continued

DATA SHEET No. 20
FINAL INSPECTION

Vehicle: _____ NHTSA Vehicle No.: _____

Date: _____ Driver: _____ Technician: _____

BRAKE STROKE MEASUREMENTS AT 85 PSI (INCHES)

Axle 1 Left/Right _____ / _____

Axle 2 Left/Right _____ / _____

Axle 3 Left/Right _____ / _____

SERVICE BRAKES

All Brakes Structurally Intact Yes No

All Brakes Function Properly Yes No

All Brakes Adjusted Within Manufacturers Recommendation Yes No
Overall Condition of Test Vehicle:

Tires replaced: ___Yes ___No

New Brake Linings: Axle #1 ___Yes ___No

Axle #2 ___Yes ___No

Axle #3 ___Yes ___No

Additional Comments:

13. REPORT OF VEHICLE CONDITION FORM

A "Report of Vehicle Condition" form must be submitted to the COTR with the copies of the Final Test Report. The first page of the form shall be completed when the test vehicle arrives at the testing laboratory. The second page of the form is completed after the test. The forms shall be LEGIBLE (hand written forms are unacceptable) and COMPLETE (all information requested is filled out).

13. REPORT OF VEHICLE CONDITION FORM



U.S. Department of Transportation
National Highway Traffic Safety Administration

REPORT OF VEHICLE CONDITION

PAGE 1

Office of Vehicle Safety Compliance/ NVS-221
400 7th St., SW, Rm 6111
Washington, DC 20590

The test vehicle is to be inspected upon arrival at the laboratory. The laboratory will report the arrival of the vehicle and any findings from the inspection to the OVSC within 24 hours.

TEST LAB INFORMATION

Lab Name & Address:	
Contact:	
Phone:	

VEHICLE INFORMATION

NHTSA NO:		COLOR:		PRICE:	
YEAR:		VIN:			
MAKE:		CONTRACT NO:		DTNH22-	
MODEL:		DEALER NAME:			
VEH TYPE :		FMVSS TO BE TESTED TO:			

VEHICLE ARRIVAL

DELIVERY DATE:		ODOMETER READING:	
CONDITION:			

RECORDED BY:		DATE:	
APPROVED BY:		DATE:	

13. REPORT OF VEHICLE CONDITION FORM

REPORT OF VEHICLE CONDITION

PAGE 2

TEST COMPLETION

Arrival Date:

Odometer Reading:

Date of Reading:

Can the vehicle be driven? (YES/NO)

List all equipment removed from the test vehicle, if any.

List any equipment added to the test vehicle?

Overall Vehicle Condition:

RECORDED BY:

DATE:

APPROVED BY:

DATE:

14. LABORATORY NOTICE OF TEST FAILURE

An apparent test failure shall be communicated by telephone to the COTR within 24 hours with written notification mailed within 48 hours (Saturday and Sundays excluded). A Laboratory Notice of Test Failure 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 post-test calibration check of some of the 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.

LABORATORY NOTICE OF TEST FAILURE TO OVSC

FMVSS No. 121, AIR BRAKE SYSTEMS TEST DATE: _____

LABORATORY: _____

CONTRACT NO.: _____; DELV. ORDER NO.: _____

LAB. PROJECT ENGINEER'S NAME: _____

VEH. MY/MAKE/MODEL: _____

VEH. BODY STYLE: _____; BUILD DATE: _____

VEH. NHTSA NO.: _____; VIN: _____

TEST FAILURE DESCRIPTION: _____

S121 REQUIREMENT, PARAGRAPH § _____

NOTIFICATION TO NHTSA (COTR): _____

DATE: _____ BY: _____

REMARKS:

