SAE International

SURFACE VEHICLE RECOMMENDED PRACTICE

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Parking Brake Structural Integrity Test Procedure Vehicles Over 4500 kg (10 000 lb) GVWR—Truck and Bus

RATIONALE

This document has been reviewed and changed per the SAE 5 year review process. The changes included editorial corrections, addition of SAE J2115, SAE J1729 and SAE J2503 references and updated practices applicable to this procedure and two additional acceptance criteria.

1. SCOPE

This SAE Recommended Practice establishes a method of evaluating the structural integrity of the parking brake system of all new trucks, buses, and combination vehicles designed for roadway use in the following classifications: TRACTOR, TRAILER, TRUCK, AND BUS: over 4500 kg (10 000 lb) GVWR.

1.1 Purpose

The main purpose of the document is to evaluate the structural integrity of a vehicle's parking brake system. However, other areas, such as suspension and drivetrain system, may also be evaluated during the test, provided that the criteria and procedure detailed as follows are not modified in any way.

1.2 Types of Parking Brake Systems to be Evaluated

1.2.1 Manually Applied—Mechanically Held

1.2.2 Power Released—Mechanically Held

1.2.3 Power Applied—Mechanically Held

2. REFERENCES

2.1 Applicable Publications

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest version of SAE publications shall apply.

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Tel: 724-776-4970 (outside USA)
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2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J293 Truck and Bus Grade Parking Performance Requirements

SAE J360 Truck and Bus Grade Parking Performance Test Procedure

SAE J1729 Parking Brake Drawbar Pull Test Procedure—Truck and Bus

SAE J2115 Air Brake Performance and Wear Test Code Commercial Vehicle Inertia Dynamometer

SAE J2503 Drawbar Pull Performance Criteria

3. EQUIPMENT (WHERE APPLICABLE)

3.1 Brake apply device (optional, but recommended to reduce variations in apply efforts)

3.2 Air pressure gages

3.3 Hydraulic pressure gages

3.4 Tire pressure gage

3.5 Torque wrench

3.6 Direct reading brake lining temperature instrument

3.7 Parking brake apply force transducer

3.8 Recording or readout device for transducers

3.9 Heavy-duty winch or powered vehicle to pull test vehicle

3.10 Calibrated load cell 0 to 88 964 N (0 to 20 000 lb)

3.11 Suitable hook-up method for pulling test vehicle

3.12 Dolly for trailer testing

3.13 Trailer air-brake charging system

3.14 Wheel alignment equipment

4. TEST PREPARATION (WHERE APPLICABLE)

4.1 Calibrate instrumentation as required.

4.2 Install new brake lining, drums and/or rotors, and brake assemblies to the manufacturer's specifications, except all brake fasteners applied to all components affected by reactive forces shall be at minimum specified torque. Record all torque values. Record pertinent brake parameters and specifications. Mark or scribe all mating surfaces for checking relative movement.

4.3 Install and locate thermocouples per SAE J2115 (where appropriate, one per brake).

4.4 Adjust entire brake system per the vehicle manufacturer's specification.

4.5 Check wheel geometry of all applicable axles and adjust to manufacturer's mean specification and record.

4.6 Install the tires and wheels offered by the manufacturer, which produce the largest tire rolling radius. Tires, at minimum, shall have a typical 200-mile preconditioning break-in and/or per the tire manufacture recommended break-in procedure, but not more than 20% worn. Set tire pressure per manufacturer's specification for vehicle test weight specified in this document.

4.7 For those vehicles, which are equipped with power-assist brake actuation, the reservoir pressure shall be set at the vehicle manufacturer's maximum recommended cutout pressure.

4.8 Actuation system to be installed, lubricated, adjusted, and inspected in accordance with the vehicle manufacturer's specification.

4.9 For trailer testing with a winch, use an axle dolly.

4.10 The test vehicle shall be loaded to the manufacturer's gross vehicle weight rating (GVWR) proportionally distributed according to individual axle system GAWR's. GVWR includes weight of test equipment and supporting dolly, if required.

5. TEST NOTES

5.1 If the parking brake is not used for service braking, burnish per SAE J360.

5.2 Adjust parking brake(s) and actuation systems in accordance with vehicle manufacturer's specifications, before and after burnishing.

5.3 All tests are to be conducted on a Test Grade to the vehicle classification and application forces per SAE J293, or by an equivalent Drawbar Pull Test per SAE J2503 using a towing vehicle or a winch. Parking brake control systems that use energy from sources other than manual are excluded from the application force requirements.

5.4 Conduct the test on a dry, brushed Portland cement concrete surface (or other surface of equivalent coefficient of surface friction) that is free from loose materials.

5.5 Initial brake lining temperatures are not to exceed 66 °C (150 °F).

5.6 Combination vehicles shall be tested per SAE J360.

5.7 Data sheets shall provide for recording the following data: loaded weight, percent grade or drawbar pull force, identification of brake system, direction of test vehicle on the grade, lining temperature, applied force and/or pressure to parking brake system, and observation of wheel roll or lock and hold or slide.

6. METHOD OF CONDUCTING ON-GRADE TEST PER SAE J360

6.1 Drive the test vehicle up the test grade, stop, and hold with the service brakes until parking brake system is activated. For test grade, see 5.3. The service brake is not used in the following sequence, except as noted.

6.2 With vehicle declutched or transmission in neutral, follow appropriate procedure notes in 6.2.1 through 6.2.3; when brake is applied, note any wheel slide or creep for a 5-min period, excluding air brakes.

6.2.1 Manually Applied—Mechanically Held

Apply brake level force, per 6.1 and 6.2, measured with force transducer to hold the test vehicle on the test grade. Record force on brake lever to hold vehicle parked with any force less than forces referenced in 5.3. Release brake lever and reapply to the same force at first vehicle movement. Repeat sequence for subsequent stops to 6.4 and 6.5.

6.2.2 Power Released—Mechanically Held

(For example, Air "Off", Spring "On") Park test vehicle on test grade by applying parking brake with control valve. Allow time for pressure to build up to the maximum brake system pressure. Record pressure. Release parking brake with control valve. At first vehicle movement, reapply parking brake control valve. Repeat sequence for subsequent stops to 6.4 and 6.5.

6.2.3 Power Applied—Mechanically Held Parking Brakes

Park test vehicle on test grade by applying parking brake with brake lever or control valve. Release power apply to ensure the vehicle is held by mechanical means. Allow time for apply power recovery pressure to build up to the manufacturer's maximum brake system specification. Record pressure. Release parking brake according to manufacturer's recommended procedure. At first vehicle movement, reapply parking brake with lever control or valve. Repeat sequence for subsequent stops to 6.4 and 6.5.

6.3 To test a trailer's parking brake system when independent from the towing equipment, the trailer and dolly, if used, shall be positioned on the test grade by the towing equipment. Apply the trailer's parking brake system following appropriate procedure in 6.2. Disconnect trailer from towing equipment. Release dolly brakes where used; note any wheel slide or creep.

NOTE: SUITABLE PRECAUTIONS MUST BE TAKEN TO STOP TRAILER IN CASE OF BREAKAWAY ON TEST GRADE.

6.4 Repeat 6.2 or 6.3 procedure for ten applications. Manually applied, mechanical parking brakes to have three additional applications at 845 N (190 lb ± 10 lb) foot pedal or 600 N (135 lb ± 10 lb) hand lever without system readjustment. Power applied, mechanically held parking brakes to have three additional applications with power assist at maximum brake system pressure. Power released, mechanically held parking brakes to have three additional applications while maximum brake system pressure is applied to the service brake actuators.

6.5 Vehicle to be turned around. Paragraphs 6.2 or 6.3, and 6.4 repeated on test grade in opposite direction.

7. METHOD OF CONDUCTING TEST ON ZERO GRADE (DRAWBAR TEST) PER SAE J1729

7.1 Position the vehicle attached to its towing vehicle or winch on a level surface. Note 5.3 for grade holding requirements. Pull test at zero grades to be equivalent.

7.2 With vehicle declutched or transmission in neutral, apply parking brakes as shown in 6.2. Pull the test vehicle with winch or towing vehicle to apply required load. Note any wheel slide or creep.

7.3 To test a trailer parking brake system when independent from the towing equipment, the trailer shall be positioned on test surface. An axle dolly with its brakes released shall be used to support the front end for trailer testing. Apply brakes (see 6.2). Pull with towing vehicle or winch to apply required load. Record pull test at first vehicle movement. Note any wheel slide or creep.

7.4 Repeat sequence as specified in 6.4.

7.5 Vehicle to be tested with towing vehicle or winch pulling from opposite end and 7.1, 7.2, 7.3, and 7.4 repeated.

7.6 In all cases, the drawbar pull force is the peak static breakaway value at the moment vehicle movement begins.

8. INSPECTION

8.1 Check and record wheel geometry of all applicable axles (see 4.5).

8.2 Check and record torque of all brake fasteners (see 4.2).

8.3 Inspect all components of the parking brake system for functional distortion, damage or relative movement.