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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

# SURFACE VEHICLE RECOMMENDED PRACTICE

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## PARKING BRAKE DRAWBAR PULL TEST PROCEDURE—COMMERCIAL VEHICLE

***Foreword***—This Document has not changed other than to put it into the new SAE Technical Standards Board Format.

***1. Scope***—This SAE Recommended Practice provides a test method and instructions for measuring performance of parking brakes on air- or hydraulic-braked vehicles equipped with in-wheel or drive-line parking brakes. This procedure applies to truck, tractor, trailer, and bus.

**1.1 Purpose**—This document establishes a uniform procedure for determining retardation force capability of the parking brakes of new commercial vehicles.

***2. References***

**2.1 Applicable Publications**—The following publications form a part of this specification to the extent specified herein. Unless otherwise specified, the latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J360—Truck and Bus Grade Parking Performance Test Procedure
SAE J1452—Trailer Grade Parking Performance Test Procedure
SAE J2115—Brake Performance and Wear Test Code Commercial Vehicle Inertia Dynamometer

2.1.2 FEDERAL PUBLICATION—Available from The Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

49 CFR 571.105—Brake Performance—Hydraulic Brake Systems

***3. Instrumentation, Equipment, and Facility***

**3.1 Instrumentation Required**

3.1.1 Brake lining thermocouples as per figures described in SAE J2115 and a suitable temperature readout device accurate to ±5.6 °C (±10 °F).

3.1.2 Load cell of 89 kN (20 000 lbf) capacity accurate to ±445 N (100 lbf).

3.1.3 PRESSURE GAUGES—0 to 900 kPa (0 to 130 psi) for air brakes.





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3.1.4 Decelerometer

3.1.5 FORCE MEASURING DEVICE—0 to 890 N (0 to 200 lbf).

**3.2 Equipment Required**

3.2.1 A device equipped with cable capable of providing a steady-state pull to the vehicle being tested.

**3.3 Facility Required**

3.3.1 All tests should be conducted on a dry, level, smooth Portland cement concrete surface (or equivalent).

***4. Vehicle Information and Data***

**4.1** Test data sheet (Figure 1) to be used as a work sheet during testing.

***5. Vehicle Conditions—***To insure the accuracy and validity of results, the following conditions should be met:

**5.1** Install new thermocoupled lining and drums/discs. Lining grind and surface finish of drums/discs must be within vehicle manufacturer's specifications.

**5.2** Adjust brakes to vehicle manufacturer's specifications.

**5.3** Tires must not be more than 20% worn and must be inflated as specified by vehicle's manufacturer.

**5.4** Load vehicle as follows:

5.4.1 TRUCK, TRACTOR, AND BUS—Load to GVWR.

5.4.2 TRAILER—Hook up trailer to tractor. Add ballast to trailer until weight of trailer and tractor equal trailer GAWR(s). Position ballast over trailer axle(s) to prevent wheel slide. (If a wheel slides during test, load trailer axle to GAWR. Conduct burnish as described in Appendix A.)

**5.5** Burnish brakes before testing as follows: (When burnishing trailer brakes, disable tractor brakes.)

With the transmission in the highest gear appropriate for a speed of 64 km/h (40 mph), make 500 snubs between 64 km/h (40 mph) and 32 km/h (20 mph) at a deceleration rate of 3 $m/s^2$ (10 $ft/s^2$), or at the vehicle's maximum deceleration rate if less than 3 $m/s^2$ (10 $ft/s^2$). Except where an adjustment is specified, after each brake application accelerate to 64 km/h (40 mph) and maintain that speed until making the next brake application at a point 1.6 km (1 mile) from the initial point of the previous brake application. If the vehicle cannot attain a speed of 64 km/h (40 mph) in 1.6 km (1 mile), continue to accelerate until the vehicle reaches 64 km/h (40 mph) or until the vehicle has traveled 2.4 km (1.5 mile) from the initial point of the previous brake application, whichever occurs first. Any automatic limiting pressure valve is to be in use to limit the pressure as designed. The brake may be adjusted up to three times during the burnish procedure, at intervals specified by the vehicle manufacturer, and may be adjusted at the conclusion of the burnishing, in accordance with the vehicle manufacturer's recommendation.

**5.6** For vehicles with a parking brake system that does not utilize service brakes, burnish parking brakes in accordance with vehicle manufacturer's recommendation.

**DRAWBAR PULL**

VEHICLE NO. _____ AMBIENT TEMP. _____

FGAWR _____ RGAWR _____ GVWR _____

GCWR _____

PUSH ROD TRAVEL 620 kPa (90 psi): _____ cm (in)

BRAKE FORCE

| Pull Position | 90 Degrees | | 180 Degrees | | 270 Degrees | | 360 Degrees | | Max. Pull |
|---|---|---|---|---|---|---|---|---|---|
| | N (lbf) | IBT °C (°F) | N (lbf) | IBT °C (°F) | N (lbf) | IBT °C (°F) | N (lbf) | IBT °C (°F) | N (lbf) |
| Forward | | | | | | | | | |
| Reverse | | | | | | | | | |

FIGURE 1—TEST DATA SHEET

***6. Parking Brake Retardation Force Test***

**6.1** Adjust brakes to vehicle manufacturer's specifications. Where applicable, measure and record pushrod travel with only service brakes applied and 620 kPa (90 psi) at chamber.

**6.2** Temperature condition the brakes by conducting brake snubs from 64 to 32 km/h (40 to 20 mph) speed at 3 m/s$^2$ (10 ft/s$^2$) deceleration at 1.6 km (1 mile) intervals until the temperature of the brakes being tested reaches 107 to 121 °C (225 to 250 °F). Conduct tests when the brake temperature is between 66 to 93 °C (150 to 200 °F). Re-heat the brakes as necessary. (If speed or deceleration are not attainable, run at maximum speed or deceleration.)

**6.3** Position test vehicle on test area in line with pull cable.

**6.4** For vehicles having any equipment (axle differential locks or multi-speed axles) which is driver-controlled, the test must be conducted in the condition which requires the highest parking brake torque.

**6.5** Connect pull cable and force measuring device. Cable should be level within ±5 degrees.

**6.6** Place marks on tire circumference at tire-ground contact point, 90, 180, and 270 degrees from that point.

**6.7 Parking Brake Application**

6.7.1 With vehicle at rest and transmission in neutral, run the tests as follows:

*6.7.1.1* *Air-Braked Vehicle*—Apply and hold service brakes by using maximum treadle (pedal) travel at compressor cut-out pressure (trailer at 690 kPa (100 psi)). Apply parking brakes on vehicle being tested. Release service brakes after parking brakes are fully applied.

*6.7.1.2* *Hydraulic-Braked Vehicle*—Apply and hold service brakes at 150 lbf pedal force (Ref. 49 CFR 571.105). Release service brakes after parking brakes are fully applied.

**6.8** Pull vehicle forward at maximum pull rate of 1.25 m/min (4 ft/min). Record force in the table in Figure 1.

6.8.1 Record peak drawbar force in 90 degrees of wheel rotation until wheels have rotated 360 degrees.

6.8.2 Release brakes and re-apply as in 6.7.1.1 or 6.7.1.2. Repeat 6.8.1 until wheels have rotated 360 degrees.

**6.9** Repeat 6.8 except pull in reverse direction.

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