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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J229

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Submitted for recognition as an American National Standard

SERVICE BRAKE STRUCTURAL INTEGRITY TEST PROCEDURE—PASSENGER CAR

Foreword—This reaffirmed document has been changed only to reflect the new SAE Technical Standards Board format.

1. Scope—This SAE Recommended Practice establishes a method of evaluating the structural integrity of the entire brake system of all passenger cars under extreme braking conditions.

1.1 Purpose—The main purpose of this document is to evaluate the structural integrity of a vehicle's braking system. However, other areas, such as the steering or suspension system, may also be evaluated during the test, providing that the criteria and procedure detailed in the following sections are not modified in any way. For repeatability, it is recommended that a brake apply device be utilized whenever possible, since it will eliminate the variations in application times and efforts of different operators.

2. References

2.1 Applicable Publication—The following publication forms a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

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

SAE J843—Brake System Road Test Code—Passenger Car and Light-Duty Truck

3. Equipment

3.1 Brake apply device (optional, but recommended).

3.2 Calibrated speedometer and odometer (a fifth wheel may be used as an alternative).

3.3 Pedal force transducer (30 Hz minimum response if fuel for spike stops).

3.4 Decelerometer.

3.5 Ambient temperature gage.

3.6 Recording equipment (pedal force versus time) 30 Hz minimum response.

3.7 Tire pressure gage.

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3.8 Wheel alignment equipment.

3.9 Torque wrench.

3.10 Brake lining temperature measuring instrumentation.

4. Test Preparation

4.1 Calibrate instrumentation as required and note calibration on data sheet.

4.2 Install new brake drums and/or rotors and brake assemblies to the manufacturer's specifications with special attention to the torque specifications of all brake fasteners.

4.3 Adjust brakes per manufacturer's specifications.

4.4 Check front and rear alignment, adjust to manufacturer's mean specifications, and record. Rear wheel toe is not required on a vehicle with a solid axle.

4.5 Vehicle test weight shall be curb weight, plus additional weights of accessories or optional equipment over 5 lb which are offered but not installed, plus a four-passenger load of 600 lb. On vehicles designed for less than four passengers, use 150 lb per passenger. All test equipment shall be part of this weight.

4.6 Install the tires and wheels offered for the vehicle by the manufacturer which produce the largest moment of inertia. Tires must be in good condition. Set tire pressure per manufacturer's specifications for vehicle test weight specified in this document.

4.7 Install plug type thermocouples in each brake (reference SAE J843). All thermocouples to be located in the approximate center of the most heavily loaded shoe, one per brake.

5. General Notes

5.1 All tests shall be conducted on a substantially level (not to exceed a ±1% grade), dry, smooth, hard surfaced roadway of Portland cement concrete (or other surface with equivalent coefficient of surface friction) that is free from loose materials.

5.2 A spike brake application is accomplished by applying a pedal force of 200 lb (100 lb overshoot permitted) while recording pedal force versus time. Rate of apply shall be 2500 lb/s. To achieve this rate, instantaneous rates can vary from 1000 to 4000 lb/s.[1] At least 160 lb of the 200 lb force shall be within this tolerance. See Figure 1 for a typical spike brake curve. Maintain pedal force until car has stopped.

1. Although tolerances of 1000 to 4000 lb/s may appear too broad, actual test curves, both manual and machine applied, show that instantaneous slopes do vary considerably. Furthermore, 40 lb of the 200 lb pedal force has been exempted from this rate in order to accommodate the typical dip in the curve, as well as miscellaneous short duration spikes. Thus, it is intended that the basic slope of the curve should be 2500 lb/s for 160 lb of the 200 lb force. However, slight deviations in the curve must be tolerated in order to achieve this rate.

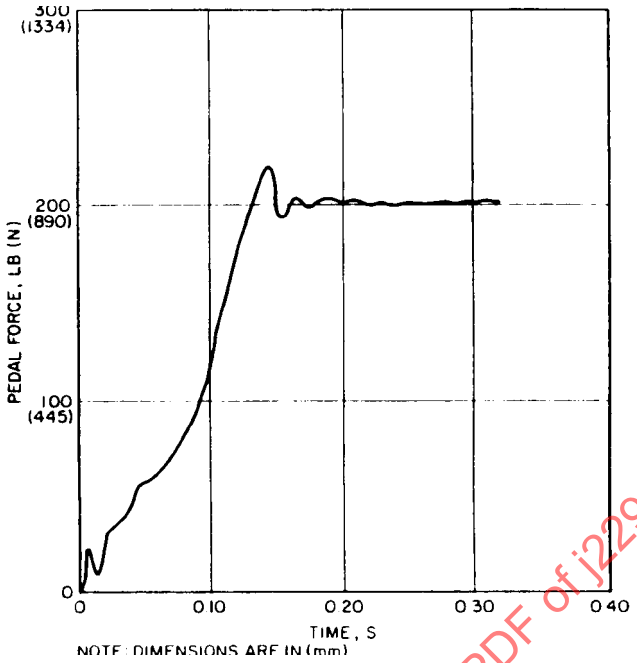

FIGURE 1—TYPICAL SPIKE BRAKE APPLICATION

5.3 In any series of spike brake applications, the initial brake temperature for the first stop shall be 200 °F. Initial brake temperature is defined as 0.2 mile before stop (average temperature of brakes on hottest axle), brakes off. If brakes require warming, use burnishing procedure (6.3.1).

5.4 Spike brake applications are to be made in normal driving gear. On cars with manual transmission, disengage the clutch.

5.5 Driving speed between spike brake applications is to be at the subsequent test speed. Acceleration to all test speeds is to be moderate.

5.6 Vehicle function stops (6.2.2, 6.4.2, etc.) may be made as soon as convenient after spike brake applications and need not be made at any specific initial brake temperature.

5.7 During all phases of this procedure, note and record any unusual braking or handling characteristics of the vehicle.

6. Procedure

6.1 **Preburnish Check—**In order to allow for a general check of instrumentation, brakes, and vehicle function, the following stops are to be run, noting pedal force for each stop:

a. Number of Stops—10
b. Speed—30 to 0 mph
c. Deceleration—10 fpsps
d. Interval—1 mile
e. Cooling Speed—40 mph, normal driving gear

6.2 Preburnish Spike Brake Application

6.2.1 Make one spike brake application from 20 mph and immediately drive 0.5 mile and make one spike brake application from 40 mph.

6.2.2 Check brakes and vehicle function by making a stop from 30 mph at 10 fpsps. Note pedal force.

6.3 Burnish

6.3.1 Make 200 burnishing stops from 40 mph at 12 fpsps in normal driving gear. Stop interval shall be as required to achieve 250 °F "initial brake temperature" or a maximum of 1.0 mile.

NOTE—The 1.0 mile maximum must be observed even though the initial temperature exceeds 250 °F. Cooling speed shall be 40 mph with moderate acceleration to cooling speed.

6.3.2 Adjust brakes after burnishing per manufacturer's specifications.

6.4 Post Burnish Spike Brake Applications

6.4.1 Make one spike brake application at each of the following speeds at 1.0 mile intervals: 10, 20, and 40 mph.

6.4.2 Check brakes and vehicle function by making a stop from 30 mph at 10 fpsps. Note pedal force.

6.4.3 Make two consecutive spike brake applications in reverse from 10 mph (estimated).

6.4.4 Check brakes and vehicle function by making a stop from 30 mph at 10 fpsps. Note pedal force.

6.4.5 Make two spike brake applications from 10 mph at 0.25 mile intervals.

6.4.6 Check brakes and vehicle function by making a stop from 30 mph at 10 fpsps. Note pedal force.

6.4.7 Make three spike brake applications from 40 mph at 1.0 mile intervals.

6.4.8 Check brakes and vehicle function by making a stop from 30 mph at 10 fpsps. Note pedal force.

6.5 Inspection

6.5.1 Check and record front end alignment and rear wheel toe. (Rear wheel toe is not required on vehicles with solid rear axle.)

6.5.2 Inspect all components of the brake system.

PREPARED BY THE SAE BRAKE STANDARDS COMMITTEE 7—ROAD TEST PROCEDURES