

**VEHICLE GRADE PARKING  
PERFORMANCE TEST CODE—SAE J360****SAE Recommended Practice**

Report of Brake Committee approved September 1968.

**1. Purpose**—This SAE Recommended Practice establishes a uniform procedure for determining the parking performance on a grade by the parking brake systems of new motor vehicles intended for roadway use.

**2. Scope**—This practice establishes grade parking performance with respect to:

- 2.1 Ability of the parking brake system to lock the braked wheels.
- 2.2 The vehicle holding or sliding on the grade, fully loaded or unloaded.
- 2.3 Applied manual effort.
- 2.4 Preburnished and burnished friction conditions.
- 2.5 Down and up grade directions.

**3. Introduction**—The ability to hold a vehicle stationary on a grade involves two performance factors: (1) overcoming the downhill grade force with the parking brake system by preventing rotation of the braked wheels, and (2) having sufficient weight on the braked wheels to prevent the vehicle from sliding on the roadway. By the use of this procedure, the manually applied input effort required to prevent braked wheel rotation can be measured and the stability of a vehicle parked on a grade can be observed.

**4. Instrumentation**

- 4.1 Push-pull force transducer (or equivalent).
- 4.2 Decelerometer.

**5. Test Preparations**

5.1 On the brakes applied by the parking brake system, use new lining and drums or discs of original equipment material and install in accordance with the vehicle manufacturer's specifications.

5.2 Parking brake assemblies and actuation systems are to be installed, lubricated, adjusted, and inspected in accordance with the vehicle manufacturer's specifications.

5.3 The vehicle is to be tested in both the fully loaded and unloaded condition. For the purposes of this test code: *fully loaded* shall be the manufacturer's maximum rated weight without exceeding any individual axle load limit; and *unloaded* shall be the vehicle weight with no payload, with driver and observer on the front seat, and with test equipment. The sequence of testing may be arranged to suit the desired sequence of vehicle loading and unloading, providing any required preburnish tests are completed before burnish.

5.4 Tires are to be new, or not more than 20% worn, and inflated to pressures specified by the vehicle manufacturer.

**6. Test Notes**

6.1 Conduct the test on a dry, smooth Portland cement concrete surface (or other surface of equivalent coefficient of surface friction) that is free from loose materials and has a grade equal to or greater than any specified grade requirement for the test vehicle.

6.2 Brake drums or discs are to be within a temperature range of 40-150 F during the test.

6.3 With variable input systems, conduct the test to establish the applied manual effort or pressure required to lock the braked wheels. With pressure-applied mechanically locked actuators, make observations with applying pressure removed.

6.4 With fixed input systems, determine the manual effort required to actuate the system control and observe whether the braked wheels lock or roll.

6.5 For vehicles having any equipment which can be placed in or out of engagement by the driver so as to vary either the number of axles braked or the amount of torque imposed on the parking brake(s), conduct the test to determine parking performance under conditions of practical on-grade usage of such equipment which obtains maximum and minimum braked weight and parking brake torque.

6.6 Parking brake systems employing service brakes that receive usage prior to being placed in service need not be tested before burnishing because of the difficulty of obtaining reliable and repeatable preburnish data. Parking brake systems which employ a brake that is not a part of the service brake system and are placed in service without any usage shall be tested before and after burnish.

6.7 Vehicles equipped with parking brake systems employing cable or rod actuation of service brakes shall be allowed to roll off the grade after each data reading. This will improve repeatability of results by allowing realignment between axle and actuation parts and by removing system hysteresis.

6.8 When testing a vehicle(s) that can form a combination of vehicles, it shall be positioned on the test grade by a powered unit in a manner consistent with normal usage and the parking brake system(s) actuated. If the test vehicle(s) can be safely and readily disconnected from the powered unit on the grade, it shall be tested disconnected and in all forms in which it is normally used and parked. If the vehicle(s) cannot be safely and readily disconnected on the grade, it shall be tested as a combination vehicle.

**6.9 Method of Conducting On-Grade Test**

6.9.1 Place driver selected equipment (see paragraph 6.5) in desired condition.

6.9.2 Drive the test vehicle up the test grade, stop, and hold with the service brakes.

6.9.3 With vehicle declutched or transmission in neutral, allow the vehicle to creep very slowly under control of the service brakes. Slowly apply the parking brake and, as the parking brake energizes, release the service brake.

6.9.4 For variable input systems, record the minimum applied effort or pressure to lock the braked wheels. For fixed input systems, record the applied effort or pressure and observe if the braked wheels are rolling or locked. Observe vehicle stability and record whether vehicle holds or slides on the grade.

6.9.5 Apply service brakes and release the parking brake and repeat test to obtain a minimum of three consistent readings. If the system is a cable or rod actuated service brake, remove vehicle from grade after each reading.

6.9.6 Repeat all steps in the down grade direction.

6.9.7 Repeat all steps for each test condition of driver selected equipment.

6.10 Data sheets should provide for recording the following data: loaded vehicle or combination weight and items making up the weight, unloaded weight, braked axle weight, identification of equipment affecting braked weight, and brake torque and how employed in test, per cent grade, identification of brake system preburnished and after burnished data, direction of vehicle on the grade, applied input effort, and observation of wheel roll or lock and vehicle hold or slide.

**7. Test Procedure**

**7.1 Preburnish Grade Test, Vehicle Unloaded**—If test vehicle parking system does not employ a service brake(s), conduct a preburnish on-grade test in accordance with paragraph 6.9.

**7.2 Preburnish Grade Test, Vehicle Loaded**—Same as paragraph 7.1, except with vehicle loaded.

**7.3 Burnish Procedure, Vehicle Loaded**

7.3.1 If the parking brake is also used for service braking, burnish in accordance with SAE J843 for passenger cars and SAE J786 for all other vehicles.

7.3.2 If the parking brake is not used for service braking, burnish as follows: make 10 stops from 10 mph at 3 fpsps. Space the stops a minimum of 2.5 miles apart and operate the vehicle at 20 mph be-