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Minimum Performance Criteria for Brake Systems for Off-Highway Trucks and Wagons — SAE J166a

SAE Recommended Practice
Last Revised September 1975

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MINIMUM PERFORMANCE CRITERIA FOR BRAKE SYSTEMS FOR OFF-HIGHWAY TRUCKS AND WAGONS – SAE J166a

SAE Recommended Practice

Report of Construction and Industrial Machinery Technical Committee approved March 1971 and last revised September 1975.

1. **SCOPE**—Minimum performance criteria for service braking systems, emergency stopping systems and parking systems for Integral Dumpers, Combination Dumpers, and Dumper trains are provided in this Recommended Practice.

NOTE: See Appendix for vehicle identification.

2. PURPOSE

2.1 To define minimum braking system performance for in-service vehicles.

NOTE: This is not a design standard.

2.2 To provide test criteria by which vehicle braking system compliance may be verified.

3. BRAKING SYSTEMS

3.1 **Service Braking System**—The primary system of any type used for stopping and holding the vehicle.

3.2 **Emergency Stopping System**—The system used for stopping a vehicle in the event of any single failure in the service braking system.

3.3 **Parking System**—A system to hold a stopped vehicle stationary.

3.4 **Common Components**—The above braking systems may use common components. However, a failure of a common component shall not reduce the effectiveness of the vehicle stopping capability below the emergency stopping performance as defined in section 4.2.1.

4. BRAKING SYSTEMS PERFORMANCE

4.1 **Service Braking System**—All vehicles shall have braked wheels on at least one axle of the prime mover and one axle of each trailing unit.

4.1.1 **Stopping Performance**—The service braking system, when tested in accordance with section 5, shall stop the vehicle within the distance specified in Table 1 for Integral Dumpers or in Table 2 for Combination Dumpers and Dumper Trains.

4.1.2 **Holding Performance**—The service braking system shall have capability equivalent to holding the vehicle stationary on a 30% dry swept concrete grade. This criterion shall apply to both the forward and reverse directions.

4.1.3 **System Recovery**—With the vehicle stationary, the service braking system's primary power source shall have capability of delivering at least 70% of maximum brake pressure measured at the brakes when the brakes are fully applied twelve (12) times at the rate of four (4) applications per minute with the engine at maximum governed rpm.

4.1.4 **Warning Device**—The service braking system using stored energy shall be equipped with a warning device which actuates before system energy drops below 50% of the manufacturer's specified maximum operating energy level. The device shall be readily visible and/or audible to the operator, and provide a continuous warning. Gages indicating pressure or vacuum shall not be acceptable to meet these requirements.

4.2 **Emergency Stopping System**—All vehicles shall be equipped with an emergency stopping system.

4.2.1 **Stopping Performance**—The emergency stopping system when tested in accordance with section 5 shall stop the vehicle within the distance shown in parenthesis in Table 1 for Integral Dumpers or in Table 2 for Combination Dumpers and Dumper Trains.

4.2.2 **Emergency Brake Application**—The emergency system shall be capable of being manually applied by a person seated in the driver's seat. The system shall be arranged so that it cannot be released from the driver's seat after any application unless immediate reapplication can be made from the driver's seat to stop the vehicle or combination of vehicles.

4.2.2.1 In addition to the manual control, the emergency stopping system may also be applied automatically. If an automatic emergency stopping system is used, the automatic application shall occur after the warning device is actuated.

4.3 **Parking System**—All vehicles shall be equipped with a parking system capable of being applied by a person seated in the driver's seat.

4.3.1 **Parking System Performance**—The parking system shall have capability equivalent to holding the vehicle stationary on a 15% dry swept concrete grade.

4.3.2 **Remain Applied**—The parking system when applied shall maintain the parking performance in compliance with paragraph 4.3.1 despite any

contraction of the brake parts, exhaustion of the source of energy, or leakage of any kind.

5. BRAKE TEST CRITERIA

5.1 Facilities and Instrumentation

5.1.1 The test course shall consist of a clean swept, level, dry concrete or other specified surface of adequate length to conduct the test. The approach will be of sufficient length, smoothness, and uniformity of grade to assure stabilized travel speed of the vehicle. The braking surface shall not have over 1% grade in the direction of travel, or no more than 3% grade at right angles to the direction of travel.

5.1.2 An instrument to measure the stopping distance with an accuracy of $\pm 1\%$.

5.1.3 A means to measure the test speed with an accuracy of $\pm 5\%$ of actual speed.

5.1.4 A means for determining the vehicle weight.

5.1.5 A means for measuring the braking system energy level.

5.2 Test Requirements

5.2.1 All tests to be conducted with the applicable braking system fully charged.

5.2.2 Test vehicle to be loaded to the manufacturer's gross vehicle weight rating and distribution.

5.2.3 Stopping distance to be measured in metres (feet) from the point at which the vehicle's brake control is applied to the point at which the vehicle is stopped.

5.2.4 Stopping tests to be conducted from a vehicle speed of not less than 32 km/h (20 mph) or maximum speed if less than 32 km/h (20 mph).

5.2.5 Stopping tests shall be conducted with the transmission in the gear commensurate with the speed required in section 5.2.4.

5.2.6 Auxiliary retarders shall not be used in the tests unless the retarder is simultaneously actuated by the applicable brake system control.

5.2.7 Maximum allowable efforts to actuate braking systems as defined in section 3 are 90.7 kg (200 lb) for a foot-operated system; and 54.4 kg (120 lb) for a hand-operated system.

TABLE 1—INTEGRAL DUMPERS—
BRAKE PERFORMANCE REQUIREMENTS

SI (METRIC UNITS)

Vehicle Speed, km/h

Vehicle Weight, kg	8	16	24	32	40	48
Service Brake Maximum Stopping Distance—Metres (Emergency Brake Maximum Stopping Distance—Metres)						
0						
Up to 45,000	2.0 (4.0)	5.6 (13.0)	10.9 (27.1)	17.9 (46.2)	26.5 (70.4)	36.9 (99.5)
Over 45,000 to 90,000	3.1 (5.5)	7.8 (16.0)	14.2 (31.6)	22.3 (52.1)	32.1 (77.7)	43.5 (108.3)
Over 90,000 to 180,000	4.7 (7.7)	11.1 (20.4)	19.2 (38.1)	29.0 (60.9)	40.4 (88.7)	53.5 (121.6)
Over 180,000	6.4 (9.9)	14.5 (24.9)	24.2 (44.9)	35.6 (69.9)	48.8 (99.9)	63.5 (135.0)