

**S.A.E.  
LIBRARY**

# **Minimum Performance Criteria for Braking Systems for Rubber-Tired Cranes and Excavators — SAE J1080**

**SAE Recommended Practice  
Approved September 1975**

**THIS IS A PREPRINT AND WILL  
APPEAR IN THE NEXT EDITION  
OF THE SAE HANDBOOK**

**Society of Automotive Engineers, Inc.**  
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096



**PREPRINT**

# MINIMUM PERFORMANCE CRITERIA FOR BRAKING SYSTEMS FOR RUBBER-TIRED CRANES AND EXCAVATORS—SAE J1080

## SAE Recommended Practice

Report of Construction and Industrial Machinery Technical Committee approved September 1975.

1. **SCOPE**—Minimum performance criteria for service braking systems, emergency stopping systems, and parking systems for all rubber-tired cranes and excavators, Classes 1 through 5, as described in the addendum, are provided in this SAE recommended practice.

### 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's stopping capability below the emergency stopping performance as defined in paragraph 4.2.1.

### 4. BRAKING SYSTEM PERFORMANCE

4.1 **Service Braking System**—The service braking system, when tested in accordance with section 5 shall stop the vehicle within the distance specified in Tables 1 and 2.

4.1.1 **Holding Performance**—The service braking system shall have capability equivalent to holding the vehicle stationary on a 25% dry swept concrete grade under conditions as specified in paragraph 5.2.2. This criterion shall apply to both forward and reverse directions.

4.1.2 **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.

4.1.3 **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 Tables 1 and 2.

4.2.2 **Emergency Brake Application**—The emergency system shall be capable of being 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.

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 15% dry swept concrete grade. This criterion shall apply to both the forward and reverse directions.

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 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 of determining the vehicle weight.

5.1.5 A means for measuring the braking system energy level.

5.1.6 A means of measuring the braking system actuation effort.

#### 5.2 Test Requirements

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

5.2.2 Test vehicle to be equipped with components in the transport position as recommended by the manufacturer.

5.2.3 Stopping distance to be measured in meters (ft) 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 speed of not less than 32 km/h (20 mph) nor more than 48 km/h (30 mph) or maximum speed if less than km/h (20 mph).

5.2.5 Stopping test shall be conducted with the transmission in the gear commensurate with the speed required in paragraph 5.2.4. The power train may be disengaged prior to completing the stop.

5.2.6 Auxiliary retarders shall not be used in the test 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—BRAKE PERFORMANCE REQUIREMENTS  
FOR CLASS 1 AND 2

#### SI (METRIC) UNITS Vehicle Speed kph

|                    | 24                                                                                                   | 32             | 40             | 48             |
|--------------------|------------------------------------------------------------------------------------------------------|----------------|----------------|----------------|
| Vehicle Weight, kg | Service Brake Maximum Stopping Distance—Metres<br>(Emergency Brake Maximum Stopping Distance—Metres) |                |                |                |
| Up to 32,000       | 8.2<br>(20.0)                                                                                        | 13.3<br>(34.2) | 19.7<br>(52.1) | 27.3<br>(73.6) |
| Over 32,000        | 9.7<br>(22.4)                                                                                        | 15.5<br>(37.3) | 22.4<br>(55.8) | 30.6<br>(78.2) |

#### ENGLISH UNITS Vehicle Speed mph

|                    | 15                                                                                               | 20          | 25          | 30           |
|--------------------|--------------------------------------------------------------------------------------------------|-------------|-------------|--------------|
| Vehicle Weight, lb | Service Brake Maximum Stopping Distance—Feet<br>(Emergency Brake Maximum Stopping Distance—Feet) |             |             |              |
| Up to 70,000       | 27<br>(66)                                                                                       | 44<br>(113) | 65<br>(172) | 90<br>(243)  |
| Over 70,000        | 32<br>(74)                                                                                       | 51<br>(123) | 74<br>(184) | 101<br>(258) |