



SURFACE VEHICLE STANDARD

J1977™

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Braking Performance - Rubber-Tired, Self-Propelled Cranes

RATIONALE

Updated the References section and formatting of this document to current guidelines.

1. SCOPE

This SAE Standard applies to machines as defined in Appendix A. Some of these machines can travel on-highway but function primarily off-highway.

1.1 Purpose

This document specifies braking system performance and test criteria for rubber-tired cranes as defined in the Scope and is a guideline to enable uniform evaluation of the braking capability of these machines. Service, secondary, and parking brake systems are included.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 1-877-606-7323 (U.S. and Canada only) or 1-724-776-4970 (outside U.S. and Canada), www.sae.org.

SAE J786A Brake System Road Test Code—Truck, Bus, and Combination of Vehicles

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2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 ISO Publications

Copies of these documents are available online at www.iso.org/store.

ISO 3450:2011 Earthmoving Machinery - Wheeled Machines - Performance Requirements and Test Procedures for Braking Systems

3. DEFINITIONS

3.1 RUBBER-TIRED CRANES

A rubber-tired machine consisting of a chassis designed for mounting an upper structure and its attachments as identified in Appendix A.

3.2 BRAKING SYSTEMS

All the elements which participate in stopping and holding the machine. Such systems consist of a supply, control, means of power transmission, and the brake.

3.2.1 SERVICE BRAKE SYSTEM

The primary system used for stopping and holding the machine.

3.2.2 SECONDARY BRAKE SYSTEM

The system used for stopping the machine in the event of any single failure in the service brake system.

3.2.3 PARKING BRAKE SYSTEM

The system used to hold a stopped machine in a stationary position for an extended period of time.

3.2.4 BRAKE SYSTEM COMPONENTS

3.2.4.1 SUPPLY

A pump or compressor in combination with a reservoir to provide the energy for actuation of the service and secondary brake.

3.2.4.2 CONTROL

The component(s) activated by the operator to cause a force to be transmitted to the brake(s).

3.2.4.3 POWER TRANSMISSION MEANS

All of the elements between the control and the brake(s) which connect(s) them (it) functionally.

3.2.4.4 BRAKE(S)

The component(s) which directly applies (apply) a force to oppose movement of the machine.

3.2.4.5 RETARDER

An energy absorption device normally used to control machine speed while descending grades.



3.3 COMMON COMPONENT

A component which performs a function in two or more braking systems.

3.4 MACHINE MASS

Operating mass of the machine up to that mass which includes the heaviest combination of equipment approved by the manufacturer of the machine, an operator of 75 kg, and with the machine fully fueled and serviced.

3.5 STOPPING DISTANCE

The distance traveled by the machine from the point on the test course at which the machine brake control actuation initial movement begins to the point where the machine is fully stopped.

3.6 MEAN DECELERATION

The average rate of change of velocity of the machine, from the instant the brake control actuation begins until a full stop is achieved. It may be determined from Equation 1:

$$a = V^2/2L \quad (\text{Eq. 1})$$

where:

a = mean deceleration in m/s^2

V = velocity in m/s of the machine immediately prior to brake control actuation

L = stopping distance in meters

3.7 BURNISH

A procedure to condition the frictional surfaces of the machine brake(s) to provide good lining to drum contact.

3.8 BRAKE SYSTEM PRESSURE

The gas or hydraulic pressure available at the brake actuation mechanism.

3.9 TEST COURSE

The surface upon which the test is conducted.

3.10 COLD BRAKES

Brakes shall be considered to be "cold" if any of the following conditions are met:

3.10.1 The brakes have not been actuated in the previous 1 hour.

3.10.2 The brakes have been cooled to 100°C or less when measured on the brake disc or on the outside of the brake drum.

3.10.3 In case of totally enclosed brakes, including oil-immersed brakes, the temperature measured on the outside of the housing is below 50°C , or within the manufacturer's specifications.

4. INSTRUMENTATION

4.1 A means to measure and record test parameters within the specified accuracy. See Table 1.

Table 1 - Test parameters

Parameter	Instrument Accuracy
Braking System Pressure	±3.0%
Machine Speed	±3.0%
Machine Mass	±2.5%
Stopping Distance	±1.0%
Brake Control Actuating Force	±3.0%
Grade	±1.0%

5. GENERAL BRAKE REQUIREMENTS

5.1 Required Brake Requirements

All machines shall be equipped with:

5.1.1 A service braking system

5.1.2 A secondary braking system

5.1.3 A parking system

5.2 Common Components

Braking systems may use common components; however, in the event of a failure of any single component, other than a tire, the braking systems shall provide machine stopping capability meeting the secondary braking system performance requirements specified in the appropriate table.

5.3 Service Braking System

All machines shall meet the service braking performance requirements specified in the appropriate table (see 7.6). All machines shall have braked wheels on all axles and wheels except for machines that fit the description of Class 3, which shall have at least two braked wheels on the one axle.

5.4 Secondary Braking System

All machines shall meet the secondary braking performance requirements specified in the appropriate table (see 7.6).

5.5 Parking Brake System

After being applied, this system shall not be dependent upon an exhaustible energy source. The parking brake system may use common components with other braking systems provided the requirements of 7.5.2 and 7.5.3 are met.