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INTERNATIONAL
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SURFACE VEHICLE STANDARD

SAE J1472

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An American National Standard

(R) Braking Performance—Roller Compactors

1. ***Scope—***This SAE Standard specifies brake system performance and test criteria to enable uniform evaluation of the braking capability of self-propelled, ride-on vibratory steel wheel, static steel wheel, and rubber-tire roller compactors with maximum level surface machine speeds of 25 km/h or less. Service, secondary, and parking brakes are included. Machines with maximum level surface machine speeds greater than 25 km/h shall conform to the requirements of SAE J/ISO 3450.

1.1 **Application—**This document applies to self-propelled, ride-on vibratory steel wheel, static steel wheel, and rubber-tire roller compactors as defined in 3.1 and as listed in SAE J1116, category 1.2, and to these same machines while in service.

2. ***References***

2.1 **Applicable Publications—**The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated the latest revision of SAE publications shall apply.

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

SAE J1017—Nomenclature—Rollers/Compactors
SAE J1116—Categories of Off-Road Self-Propelled Work Machines

2.1.2 ISO PUBLICATION—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ISO 9248—Earthmoving machinery—Units for dimensions, performance, and capacities and their measurement accuracies

3. ***Definitions***

3.1 **Roller Compactor—**A work machine having steel wheels (drums or rolls), rubber tires, or a combination of these, used to densify (or compact) soil, asphalt, or other materials through the application of static force or a combination of static and dynamic forces to increase the load-bearing capacity of the surface. For nomenclature and illustrations, see SAE J1017.

3.2 **Brake Systems—**All the components which combine together to stop and/or hold the machine. Such systems consist of the control(s), means of brake actuation, the brake(s), and all parts connecting the brake(s) to the steel wheels or tires.

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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 stationary.

3.3 Common Component—A component that performs a function in two or more brake systems.

3.4 Machine Mass—The manufacturer's stated maximum machine mass with an operator of 75 kg, with the machine fully fueled and serviced, and with the sprinkler water reservoir(s) full.

4. General Brake System Requirements

4.1 Required Brake Systems—Machines shall be equipped with:

a. A Service Brake System
b. A Secondary Brake System
c. A Parking Brake System

4.2 No brake system shall contain a disconnect such as a clutch or shiftable gear box which allows disabling the brake(s).

4.2.1 Brake disconnects designed to allow movement of disabled machines shall be located outside the operator's station unless they can be reapplied immediately.

4.2.2 A power-source disconnect designed for cold-weather starting which also disables a brake system, shall require application of the parking brake prior to disconnection.

4.3 Service Brake System—All machines shall meet the service brake performance requirements specified in 6.4.1 and 6.5.1.

4.3.1 If other systems are provided with power from the service brake system, any failure in these systems shall be considered the same as a failure in the service brake system.

4.4 Secondary Brake System—All machines shall meet the secondary brake performance requirements specified in 6.5.2.

4.5 Parking Brake System—All machines shall meet the parking brake performance requirements of 6.4.2.

4.5.1 After being applied, this system shall maintain the required parking performance despite any contraction of the brake parts or leakage of any kind. This system shall not be dependent upon an exhaustible energy source.

4.6 The previous systems may use common components. However, a failure of any single component shall not reduce the effectiveness of the machine's stopping capability to less than the secondary stopping performance, as defined in 6.5.2.

4.7 Brake System Controls—All brake system controls shall be capable of being applied from the operator's station. The secondary and parking system(s) control(s) shall be arranged so that they cannot be released from the operator's station after any application unless immediate reapplication can be made from the operator's station.

4.7.1 The secondary and parking brake systems may be applied automatically.

4.8 Warning Device (Stored Energy Sources)—If stored energy is used for the service brake system, that system shall be equipped with a warning device which activates before system energy drops below the greater of 50% of the manufacturer's specified maximum operating energy level or the level required to meet the secondary stopping requirements. The device shall readily attract the operator's attention by providing a continuing visual or audible warning. Gauges indicating pressure or vacuum do not meet this requirement.

5. Brake Test Criterion

5.1 Facilities and Instrumentation

5.1.1 The test course shall consist of a hard, dry surface (ground moisture may be present to the extent that it does not adversely affect the braking surface) with a well compacted base. The approach will be of sufficient length, smoothness, and uniformity of grade to assure stabilized travel speed of the machine. The test course shall not have more than 3% grade at right angles to the direction of travel. Grade in the direction of travel shall be as specified for the test being conducted.

5.1.2 A means shall be provided to measure and record these parameters within the specified accuracy shown in Table 1 (reference ISO 9248).

TABLE 1—INSTRUMENT ACCURACY LEVELS

PARAMETER	INSTRUMENT ACCURACY
Brake System Pressure	±0.2%
Machine Speed	±2.0%
Machine Mass	±2.0%
Stopping Distance	±0.5%
Brake Control Actuating Force	±1.0%
Grade	±1.0%

5.2 Test Requirements

5.2.1 Manufacturer's precautions shall be observed while conducting performance tests.

5.2.2 All parameters related to brake systems shall be within the machine manufacturer's specifications; that is, tire size and pressure, brake adjustment, warning device actuation point, etc. All power-assist pressures shall be within the machine manufacturer's specification range. No manual adjustment(s) shall be made to the brake system during any one performance test.

5.2.2.1 Burnishing (conditioning) of brakes before testing is permissible. The burnishing procedure shall be indicated in the operator's and/or maintenance manual for the machine and shall be verified by consultation with the machine manufacturer.

5.2.3 MACHINE MASS—Machine is to be tested at the machine mass defined in 3.4.

5.2.4 Stopping distance is to be measured in meters from the point at which the brake control application begins to the point at which the machine is at rest.

5.2.5 Stopping performance tests are to be conducted from the maximum level surface machine speed per the machine manufacturer's specifications.

5.2.6 When the machine transmission provides a selection of speed ratios, the stopping tests shall be conducted with the transmission in the speed ratio corresponding to the test speed specified in 5.2.5. The powertrain may be disengaged prior to completing the stop.

5.2.7 Immediately prior to a test, the machine shall be operated until the engine, transmission, and machine fluids are at normal operating temperature.

5.2.8 Retarders shall not be used during the service brake performance test, but they are allowed to be used during the secondary brake performance test.

5.2.9 On machines where hydrostatic braking is used as the service brake, the stopping and holding performance of this system shall be conducted with the engine running.

5.2.10 When testing a vibratory machine, all tests shall be conducted without vibration.

6. Performance Tests

6.1 Control Forces—Control forces needed by the operator to meet the required braking performance for the systems defined in Section 5 shall not exceed the values in Table 2.

TABLE 2—CONTROL FORCES

CONTROL TYPE	FORCE
Finger Grasp (flip levels and switches)	20N
Hand Grasp	
Upwards	400N
Downwards	300N
Fore-Aft	300N
Sideways	300N
Foot Pedal (leg control)	600N
Foot Treadle (ankle control)	350N

6.2 System Recovery (if applicable)—With the machine stationary, the service brake system's primary power source shall have capability of delivering at least 70% of maximum brake pressure measured at the brakes when brakes are fully applied 20 times at the rate of 6 applications per minute with the engine at maximum governed RPM.

6.3 Warning Device (Stored Energy System)—The service brake system energy shall be reduced by any suitable means. The warning device (see 4.8) shall activate before system energy drops below the greater of 50% of the manufacturer's specified maximum operating energy level or the stored energy level required to meet the secondary stopping requirements (see 6.5.2). The warning device shall activate prior to any automatic application of a secondary brake system.

6.4 Holding Performance—All machines shall be tested in both the forward and reverse directions on a test course as described in 5.1.1 with grade as specified as follows:

6.4.1 The service brake system shall be capable of holding the machine on a 20% grade with the powertrain disengaged unless a hydrostatic service brake system is used. If a hydrostatic service brake system is used, the powertrain shall be engaged.

6.4.2 The parking brake system shall be capable of holding the machine on a 15% grade. The drivetrain(s) shall be disengaged.

6.4.3 If the tests in 6.4.1 and 6.4.2 are impractical, the tests may be carried out either:

a. On a tilt platform (a skid-resistant surface that may be inclined), or

b. By applying a pulling force to the machine with the transmission in neutral on a test course as described in 5.1.1 with no more than 1% grade in the direction of travel. The pulling force shall be applied horizontally near the ground to achieve a minimum force equivalent to the grades specified in 6.4.1 and 6.4.2. The equivalent force in Newtons is 1.92 times machine mass in kg for 20% grade; and 1.46 times machine mass in kg for a 15% grade.

6.5 Stopping Performance—All machines shall be tested on a test course as described in 5.1.1 with no more than 1% grade in the direction of travel. Tests shall be conducted in accordance with the conditions specified in 5.2. Stopping distance tests shall be conducted two times while traveling forward, once in each direction of the course; and two times traveling in reverse, once in each direction of the course. Stopping distances and machine speeds used in reporting the test results shall be the average of the two forward tests and the average of the two reverse tests.

6.5.1 The service brake system shall stop the machine within the distance specified in Table 3.

TABLE 3—STOPPING PERFORMANCE REQUIREMENTS

Machine Operating Mass (kg)	Service Brake System Stopping Distance in Meters (m)	Secondary Brake System Stopping Distance in Meters (m)
All	$L = 0.2\ V + 0.02\ V^2$	$L = 0.4\ V + 0.04\ V^2$

L = Stopping Distance in Meters (m)

V = Maximum Level Surface Machine Speed in Kilometers per Hour (km/h)

6.5.2 The secondary brake system shall stop the machine within the distance specified in Table 3. On machines using hydrostatic drives, the braking force of the hydrostatic motors must be removed from the drivetrain during stopping performance tests prior to engaging the secondary brake.

6.5.2.1 Alternate Test for Machines Using Hydrostatic Drives—If it is difficult to remove the hydrostatic motor retarding force or to disengage the motor and gear final drive from the drivetrain, the secondary brake system may be tested in the following way:

With the unit stationary, variable motors set to maximum displacement, and any mechanical transmissions set in the lowest speed range, apply the secondary brake and engage the hydrostatic drive system at full rated pressure alternately in forward and reverse. The unit must remain stationary. The brake must be capable of stopping a moving machine from the machine speed specified in 5.2.

7. Notes

7.1 Marginal Indicia—The change bar (l) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

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