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Brake Performance—Crawler Tractors and Crawler Loaders

Foreword—This Document has not changed other than to put it into the new SAE Technical Standards Board Format. Definitions have changed to Section 3. All other section numbers have changed accordingly.

1. Scope—This SAE Standard applies to crawler tractors and crawler loaders as identified in SAE J1057 and SAE J1116 and having a manufacturer's maximum specified speed of 16 km/h.

1.1 Purpose—To provide performance criteria for service brake systems, secondary brake systems, and parking brake systems for crawler tractors and crawler loaders.

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 J727—Nomenclature—Crawler Tractor
SAE J732—Specification Definitions—Loaders
SAE J742—Capacity Rating—Loader Bucket
SAE J818—Rated Operating Load for Loaders
SAE J1057—Identification Terminology of Earthmoving Machines
SAE J1116—Categories of Off-Road Self-Propelled Work Machines

3. Definitions

3.1 Crawler Tractor—Crawler tractor is defined in SAE J1057 and is illustrated with parts nomenclature in SAE J727. The tractor may, in addition, have any combination of attachments mounted on it that are formally approved by the machine manufacturer.

3.2 Crawler Loader—Crawler loader is defined in SAE J1057 and SAE J732. The loader may have any type of bucket or other tool, and any other combination of mounted attachments that are formally approved by the machine manufacturer.

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3.3 Brake Systems—All the components which participate in stopping and holding the machine. Such systems consist of a control, means of power transmission, and the brake itself.

3.3.1 SERVICE BRAKE SYSTEM—The primary system used for stopping and holding the machine.

3.3.2 SECONDARY BRAKE SYSTEM—The system used for stopping the machine in the event of any single failure in the service brake system.

3.3.3 PARKING BRAKE SYSTEM—The system used to hold a stopped machine in a stationary position.

3.3.4 COMMON COMPONENT—A component that performs a function in two or more brake systems.

3.4 Brake(s)—The component which directly applies a force to oppose movement of the machine. Brakes may, for example, be friction, electrical, or fluid types.

3.5 Slide—Slide, as used in this criterion, is defined as no track rotation during machine movement.

3.6 Machine Mass—Crawler Tractor—Operating mass of the machine up to the mass of 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.

3.7 Machine Mass—Crawler Loader—Operating mass of the machine up to the mass of the heaviest combination of equipment approved by the manufacturer of the machine, a loaded bucket per SAE J742 not to exceed rated load as defined in SAE J818, an operator of 75 kg, and with the machine fully fueled and serviced.

3.8 Brake Force—Decelerating force due to the brake system, plus rolling resistance, but it does not include engine torque.

4. Brake System Performance

4.1 Common Component—The brake system may use common components. However, a failure of any single component, or a failure of any single common component, shall not reduce the effectiveness of the machine's stopping capability to less than the secondary stopping performance, as defined in 4.3.1

4.2 Service Brake System—The machine shall have a service brake system.

4.2.1 BRAKE PERFORMANCE—The service brake system is tested by towing. The service brake system when fully applied on a machine moving in either forward or reverse shall cause the tracks to slide or develop a brake force in Newtons equal to 9.8 times the operating mass in kilograms.

4.3 Secondary Brake System—The machine shall have a secondary brake system capable of being applied by a person seated in the operator's seat. It also may be applied automatically.

4.3.1 BRAKE PERFORMANCE—The secondary brake system is tested by towing. The secondary brake system when fully applied on a machine moving in either forward or reverse shall cause at least one track to slide or develop a brake force in Newtons equal to 3.3 times the operating mass in kilograms.

4.3.2 SECONDARY BRAKE SYSTEM RELEASE—The secondary brake system shall be arranged so that it cannot be released from the operator's seat unless immediate reapplication can be made from the operator's seat to meet the requirements of 4.3.1.

4.4 Parking Brake System—The machine shall have a parking brake system capable of being applied and released by a person seated in the operator's seat. It also may be applied automatically.

4.4.1 PARKING BRAKE SYSTEM PERFORMANCE—The parking brake system when fully applied in either the forward or reverse direction shall either hold the tracks stopped on any incline on which the machine (and towed load if applicable) is operating unaided or develop a static brake force in Newtons equal to 6.5 times the mass of the unit in kilograms if the parking brake system is tested by pulling a parked machine.

4.4.2 REMAIN APPLIED—The parking brake system while applied shall maintain the parking brake performance in compliance with 4.4.1 despite any contraction of the brake parts or leakage of any kind. This system shall not be dependent upon an exhaustible energy source.

4.4.3 The failure of a common component may prevent the application of the parking brake system.

4.5 Control Forces—Control forces needed to meet the required brake performance for the systems defined in Section 5 shall not exceed the values in Table 1:

TABLE 1—

Control Types	Force
Finger grasp (flip levers and switches)	20 N
Hand grasp	
Upwards	400 N
Fore-aft	300 N
Sideways	300 N
Foot Pedal (leg control)	700 N
Foot Treadle (ankle control)	350 N

5. Brake Test Criteria

5.1 Facilities

5.1.1 A level (within 3% slope) test course of adequate size to conduct the test described in 4.2.1. The soil conditions of the test course should be similar to those in which the machine is operating. If these soil conditions are not available, it is recommended that the soil be of the type that contains not less than 10% clay, not more than 70% sand, and not less than 10% silt. This foregoing statement is to be used as a guideline only and is not meant to imply that a laboratory soil analysis test is required. Moisture content of the soil shall be such that the mass of the test machine can be supported with only nominal sinkage.

5.1.2 A test course for the self-propelled machine with adequate grades to simulate the conditions in 4.4.1. If a towing test is to be conducted, the course shall be level, as in 5.1.1.

5.1.3 A means of providing the force required to complete the test conditions outlined in 4.2.1, 4.3.1, and 4.4.1.

5.2 Instrumentation

5.2.1 A means to measure and record the following parameters within the specified accuracy is shown in Table 2:

TABLE 2—

Parameter	Accuracy
Brake System Pressure	±3.0%
Machine Mass	±2.5%
Brake Control Actuating Force	±3.0%
Grade	±1.0%
Brake Force	±3.0%

5.3 Test Requirements

5.3.1 The service and secondary brake performance tests are to be run by towing the machine at a speed of 2 to 5 km/h to reduce the effects of frictional drag. The transmission of the test machine shall be in neutral or in the brake position.

NOTE—Some machines are designed to automatically apply the brake system(s) when the transmission control is in the neutral position (hydrostatic drive, etc.). These machines may be tested by driving at the same speed as the towing machine, then apply the brake system(s) being tested by placing the appropriate control in the brake position.

6. Notes

6.1 **Marginal Indicia**—The change bar (I) 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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