# Braking Performance — In-Service Crawler Tractors and Crawler Loaders —SAE J1026 JUN82

SAE Recommended Practice
Completely Revised June 1982





THIS IS A PREPRINT WHICH IS SUBJECT TO REVISIONS AND CORRECTIONS. THE FINAL VERSION WILL APPEAR IN THE 1983 EDITION OF THE SAE HANDBOOK.



**PREPRINT**

# ϕ BRAKING PERFORMANCE—IN-SERVICE CRAWLER TRACTORS AND CRAWLER LOADERS—SAE J1026 JUN82

**SAE Recommended Practice**

Report of the Construction and Industrial Machinery Technical Committee, approved July 1973, completely revised by the Off-Road Machinery Technical Committee June 1982. Rationale statement available.

*1. Scope*—Minimum performance criteria for service braking systems, secondary stopping systems, and parking systems for crawler tractors and crawler loaders are provided in this SAE Recommended Practice. This is applicable to machines having a manufacturer's maximum specified speed up to 16 km/h (10 mph). Refer to SAE J1057 and J1116 for machine identification.

*2. Purpose*

**2.1** To define minimum brake system performance for in-service crawler tractors and crawler loaders. NOTE: This is not a design standard.

**2.2** To provide test criteria by which machine braking system(s) performance may be verified.

*3. Identification*

**3.1 Crawler Tractor**—Crawler tractor is identified by Fig. 7.1 in SAE J1057 and is illustrated with parts nomenclature in SAE J727b. 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 identified by Figs. 3.1.1 and 3.1.2 in SAE J1057 and in Fig. 1 in SAE J732c. 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.

*4. Definitions*

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

**4.2 Operating Mass—Crawler Tractor**—Is the in-service mass (weight) of the machine and any of its non-towed attachment(s) formally approved by the machine manufacturer.

**4.3 Operating Mass—Crawler Loader**—Is the in-service mass (weight) of the machine and any of its non-towed attachment(s) formally approved by the machine manufacturer, plus a loaded bucket per SAE J742 not to exceed rated load as defined in SAE J818.

**4.4 Braking Force**—Decelerating force due to brake/stopping system action, plus rolling resistance, but does not include engine torque.

*5. Braking System*

**5.1 Service Braking System**—The primary system used for stopping the tracks.

**5.2 Secondary Stopping System**—The system used for stopping a track in the event of any single failure in the service braking system.

**5.3 Parking System**—The system used to hold stopped tracks stationary with respect to the rest of the machine.

NOTE: The above systems 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 paragraph 6.2.1. A braking system includes all components necessary to permit the attainment of the specified performance level and begins at the machine component that must be actuated by the operator or automatic means to initiate a brake application, (pedal, lever, etc.) and ends at the machine component that contacts the ground, (tracks). A common component is defined as a component that performs a function in two or more braking systems.

*6. Braking System Performance*

**6.1 Service Braking System**—The machine shall have a service braking system.

6.1.1 BRAKING PERFORMANCE—The service braking system is tested by towing. The service braking system when fully applied on a machine moving in either forward or reverse shall cause the tracks to slide or develop a retarding force in Newtons equal to 9.8 times the operating mass in kilograms. (The towing force in pound force units must equal or exceed the operating mass in pound mass units.)

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

6.2.1 STOPPING PERFORMANCE—The secondary stopping system is tested by towing. The secondary stopping system when fully applied on a machine moving in either forward or reverse shall cause at least one track to slide or develop a retarding force in Newtons equal to 3.3 times the operating mass in kilograms. (The towing force in pounds must equal or exceed one-third the operating mass in pound mass units.)

6.2.2 SECONDARY SYSTEM RELEASE—The secondary system shall be arranged so that it cannot be released from the operator's seat after any application unless immediate reapplication can be made from the operator's seat to meet the requirements of paragraph 6.2.1.

**6.3 Parking System**—The machine shall have a parking system capable of being applied and released by a person seated in the operator's seat.

6.3.1 PARKING SYSTEM PERFORMANCE—The parking 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 braking force in Newtons equal to 6.5 times the mass of the unit in kilograms if the parking system is tested by pulling a parked machine. (The pulling force in pound force units must equal or exceed two-thirds the operating mass in pound mass units.)

6.3.2 REMAIN APPLIED—The parking system while applied shall maintain the parking performance in compliance with paragraph 6.3.1 despite any contraction of the brake parts, failure of the source of application energy, or leakage of any kind.

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

**6.4** Maximum allowable operator forces to actuate braking systems as defined in Section 4 are 890 N (200 lbf) for a foot-operated system, and 535 N (120 lbf) for a hand-operated system.

*7. Brake Test Criteria*

**7.1 Facilities**

7.1.1 A level (within 3% slope) test course of adequate size to conduct the test described in paragraph 6.1.1. 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 (weight) of the test machine can be supported with only nominal sinkage.

7.1.2 A test course for the self-propelled machine with adequate grades to simulate the conditions in paragraph 6.3.1. If a towing test is to be conducted, the course shall be level, as in paragraph 7.1.1.

7.1.3 A means of providing the force required to complete the test conditions outlined in paragraphs 6.1.1, 6.2.1, and 6.3.1.

**7.2 Instrumentation**

7.2.1 A means for determining the machine mass (weight) within an accuracy of ±2.5%.

7.2.2 A means of measuring the force specified in paragraphs 6.1.1, 6.2.1, and 6.3.1 with an accuracy of ±5%.

7.2.3 A means for measuring the forces required by the operator to actuate the different braking systems, with limits as described in paragraph 6.4.

**7.3 Test Requirements**

7.3.1 The service and secondary stopping performance tests are to be run by towing the machine at a speed of 2–5 km/h (1–3 mph) 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/stopping 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/stopping system(s) being tested by placing the appropriate control in the stopping position.



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