SAE International™

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J1282

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Snowmobile Brake Control Systems

1. ***Scope—***This SAE Recommended Practice is intended to provide the minimum acceptable criteria for snowmobile hand brake control systems. This recommendation is not intended to cover competition vehicles nor is it intended to limit development of new and/or improved technology in controls. Although these recommendations are primarily addressed to hand control systems using an outer flexible conduit with a multiple strand inner cable or hydraulic type brake control system, the basic requirements of freedom of movement, strength, material, etc., will apply to any system.

2. ***References***

2.1 **Applicable Publications—**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, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J33—Snowmobile Definitions and Nomenclature—General
SAE J44—Service Brake System Performance Requirements—Snowmobiles
SAE J45—Brake System Test Procedure—Snowmobiles

2.2 **Related Publications—**The following publications are provided for information purposes only and are not a required part of this specification.

2.2.1 SAE PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE TSB 002—Preparation of SAE Technical Reports

2.2.2 SSCC PUBLICATION—Available from Snowmobile Safety and Certification Committee, 271 Woodland Road, East lansing, MI 48823.

SSCC 52—Snowmobile Brake Control Systems (Part of SSCC 11—Safety Standards for Snowmobile Product Certification)

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3. Definitions

3.1 Snowmobile—As defined in SAE J33.

3.2 Brake Control—A hand-controlled device mounted on the steering control; generally a pivotable lever type (squeeze grip), when actuated will cause the vehicle to decelerate and/or stop the vehicle.

3.3 Control Line(s)—Rigid and/or flexible tubing used to transmit hydraulic fluid from brake control to brake cylinder.

3.4 Control Linkage—A means of transmitting mechanical motion between two or more points.

3.4.1 CONTROL CABLE ASSEMBLY—A linkage consisting of a flexible assembly with an outer housing or conduit and an inner cable, usually multiple stranded; capable of transmitting motion between two points. This assembly is provided with connection means on both ends of housing and cable.

3.5 Brake Control System—A complete system used to decelerate the vehicle. This includes the brake control, control linkage, or control line, brake assembly, springs, brackets, etc., necessary for operation of the system. Any attachment to the brake control system, such as a warning light switch, etc., shall be considered as part of the system if attachment affects the system's operation.

3.6 Right-Right Hand, Left-Left Hand—Designation refers to orientation of the vehicle when the operator is seated in the operator's position, facing forward.

3.7 Normal Position—Position of brake control system when not activated.

3.8 Shall—Indicates that there shall be no deviation for a specific requirement.

3.9 Should—Indicates that noncompliance with a specific recommendation is permissible.

4. Requirements and Recommendations

4.1 Requirements—The brake control system shall meet the following minimum performance criteria when tested in accordance with Section 5, or meet the following design requirements verified by visual inspection:

4.1.1 The brake control(s) shall be on the left side of the steering control adjacent to, or at, the left-hand position.

4.1.2 Lever type brake control shall be positioned so that pivoting the lever toward the steering control shall decelerate or stop the vehicle.

4.1.3 LEVER, MAXIMUM EXTENSION—Full extension of the brake control lever at the center of action shall not exceed 89.2 mm (3.5 in). The center of action is the mid-point of a line drawn from the top of the lever to its pivot point. The normal extension will be the shortest dimension through the center of action to the outside surfaces of the lever and the handlebar gripping point. (See Figure 1.)

4.1.4 The brake control system shall, when released from any partial or full-braked position, automatically return to the normal position, and the brake shall deactivate within 1 s, except when such brake control system is equipped with a locking device for parking purposes, and the locking device has been activated.

4.1.5 The brake control system's performance shall not be adversely affected by climatic conditions during vehicle operation.

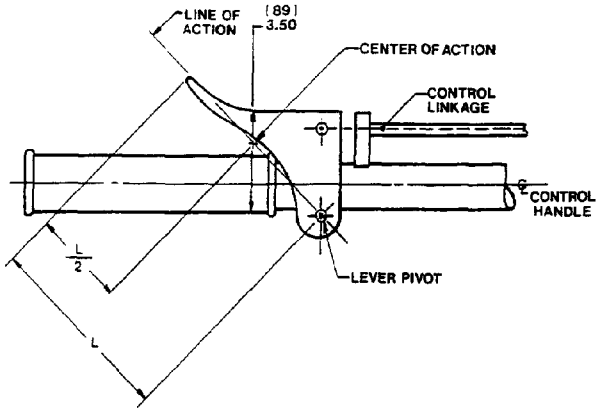

FIGURE 1—LEVER, MAXIMUM EXTENSION

4.1.6 The brake control system shall be protected from areas which would cause the system's temperature to exceed the temperature limit of the material used.

4.1.7 The brake control system shall be protected so that with all guards and shrouds in place, it cannot be inadvertently pulled or snagged in a manner that would activate the brake.

4.1.8 Motion of any part of the vehicle, such as the steering control, shall not cause activation, prevent activation, or jam the brake control system.

4.2 Recommendations—The following design recommendations should improve the performance and safety of a brake control system:

4.2.1 The control system should be routed to avoid entrapment of moisture, and to minimize accidental damage caused by contact with moving parts within the machine.

4.2.2 Control cable assembly, when used, should be routed with bend radii as large as practical. Where small radii are necessary, adequate strain relief protection should be provided to insure that the conduit will not kink.

4.2.3 The adequacy of the brake control system should be verified by field testing.

5. Tests

5.1 General Requirements

5.1.1 A minimum of two samples of each type of brake control system are to be tested.

5.1.2 The brake control system used throughout the following testing shall be identical to those to be used in vehicle production.

5.1.3 All brake control system tests shall be conducted on a vehicle with production routing or on a suitable fixture that duplicates the location of components and routing.

5.1.4 Room temperature is defined as being in the range of 15 to 27 °C (60 to 80 °F).

5.1.5 The engine does not have to operate unless otherwise noted.

5.1.6 Components may be lubricated at time of initial assembly if specified on production assembly specification. After tests have started, lubrication of any component of the brake control system other than components which receive lubrication during normal maintenance operations or which are specified in vehicle service instructions shall not be allowed.

5.1.7 Tests shall be run in the following sequence:

5.2 System Performance Test

5.2.1 SCOPE—To determine the adequacy of the performance of the brake control system.

5.2.2 REQUIREMENTS—The brake control system shall meet the requirements of SAE J44.

5.3 Strength Test

5.3.1 SCOPE—Determine the adequacy of the brake control system to withstand panic forces which may be imposed by the operator.

5.3.2 REQUIREMENTS—The brake control system shall withstand a minimum force of 400 N (90 lb). (See Figure 2.) This first test is to be conducted at room temperature; subsequent tests will be required in 5.4, 5.5, and 5.6.

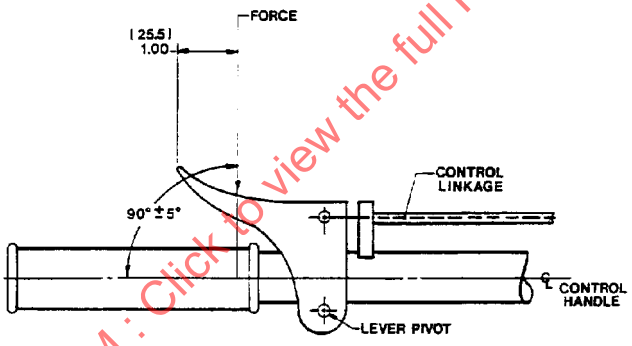

FIGURE 2—BRAKE CONTROL SYSTEM REQUIREMENTS

5.4 System High Temperature Test

5.4.1 SCOPE—To determine the effect of elevated temperature and wear on operation of the brake control system.

5.4.2 TEST PROCEDURE

5.4.2.1 Conduct the test at a temperature of 49 °C (120 °F) minimum. If, however, a portion of the brake control system is exposed to a higher temperature in service, then at least this portion of the brake control system shall be tested at this higher temperature. (Refer to 5.4.2.2.)

5.4.2.2 Determine the maximum temperature to which the brake control system is exposed when the snowmobile has operated for a minimum of 30 min under load at an ambient temperature of at least 10 °C (50 °F) and use this temperature to conduct the 5.4.2.3 test. If a minimum ambient of 10 °C (50 °F) cannot be obtained, subtract the ambient temperature from 10 °C (50 °F) and add this difference to the maximum under-hood temperature to which the brake control system is exposed at the lower ambient. Use this temperature to conduct the 5.4.2.3 test.

5.4.2.3 Cycle the brake control system through design operating range with a minimum actuation force 50% higher than that required to meet the requirement of SAE J45 (6.3, Effectiveness Test), at a rate not to exceed 60cycles/min for 25 000 cycles. Cycles may be used toward the 100 000 cycles of the 5.5 test.

5.4.2.4 The brake control system shall be subjected to 5.3, while remaining at temperature, per 5.4.2.1 or 5.4.2.2.

5.4.3 TEST ACCEPTANCE—The brake control system shall remain fully functional throughout and upon completion of testing.

5.5 System Cycle Test

5.5.1 SCOPE—Determine the effect of wear of the brake control system on control operations.

5.5.2 PROCEDURE

5.5.2.1 Conduct tests at room temperature.

5.5.2.2 The brake control system shall be cycled through the operating range (control linkage travel) with an actuation force 50% higher than that required to meet the requirement of SAE J45 (6.3, Effectiveness Test), at a rate not to exceed 60 cycles/min for a minimum of 100 000 cycles.

5.5.2.3 Cycles accumulated in 5.4 can be credited toward the 100 000 cycles required for this test.

5.5.2.4 Subject brake control system to 5.3.

5.5.3 TEST ACCEPTANCE

5.5.3.1 The brake control system shall remain fully functional throughout and upon completion of testing.

5.6 System Low Temperature Tests

5.6.1 SCOPE—To determine the effect of high relative humidity and subzero temperatures on brake control system operation.

5.6.2 TEST PROCEDURE

5.6.2.1 The brake control system shall be exposed to a temperature of –40 °C ± 3 °C (–40 °F ± 5 °F) for a minimum of 2 h and then exposed to a minimum relative humidity of 60% at room temperature for a period of 30 min ± 10 min, after which the system shall be exposed again to a temperature of –40 °C ± 3 °C (–40 °F ± 5 °F) for a period of 4 h ± 30 min.

5.6.2.2 Subject to 5.6.3; after conditioning per 5.6.2.1, the brake control, while still at –40 °C ± 3 °C (–40 °F ± 5 °F), shall be actuated (braking force applied).

Actuation of control shall be repeated at least five times within 60 s with a minimum actuation force 50% higher than that required to meet the requirement of SAE J45 Section 6.3 ‘Effectiveness’.

5.6.2.3 Subject to 5.6.3; the brake control system shall be subjected to 5.3, while remaining at temperature, per 5.6.2.2.

5.6.3 TEST ACCEPTANCE

5.6.3.1 The brake control system shall remain fully functional throughout and upon completion of testing.