SURFACE VEHICLE RECOMMENDED PRACTICE

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Superseded by J44

Brake System Test Procedure - Snowmobiles

RATIONALE

Document is being cancelled as its content is being transferred into SAE J44.

CANCELLATION NOTICE

This Technical Report has been declared “CANCELLED” as of March 2021 and has been superseded by SAE J44. By this action, this document will remain listed in the respective index, if applicable. Cancelled Technical Reports are available from SAE.

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1. SCOPE

This SAE Recommended Practice establishes a uniform procedure for the level surface testing of hand-operated brake systems on recreational noncompetitive snowmobiles.

1.1 Purpose

This procedure offers a method of testing snowmobiles on turf. Turf is preferred over snow because test repeatability is more easily obtained. In addition, tests shall be conducted under winter conditions to ensure that the braking systems remain operative and that the vehicle has no undue tendency to lose stability, overturn, or swerve out of a test lane 1.2 m (4 feet) wider than the vehicle when the brakes are applied. The purpose of the document is to establish brake system capabilities with regard to deceleration or stopping distance versus applied brake lever force, as affected by vehicle speed, brake temperature, and usage.

2. REFERENCES

2.1 Related Publications

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

2.1.1 SAE Publications

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

SAE J44 Service Brake System Performance Requirements - Snowmobiles

SAE J1282 Snowmobile Brake Control Systems

3. DEFINITIONS

3.1 BRAKE LEVER FORCE

A steady force applied in a direction normal to the handle grip in the plane of rotation of the hand brake lever at a distance no more than 25.4 mm (1 inch) from the end of the control lever. See 5.3.2.

3.2 DECELERATION

Average rate of change of vehicle speed during stopping time. Numerically equal to the initial vehicle speed divided by the stopping time. Does not denote instantaneous deceleration at some time during brake application.

3.3 AVERAGE DECELERATION

Refers to the average of the previous decelerations over the required number of tests.

3.4 INITIAL VEHICLE SPEED

Steady-state vehicle speed immediately prior to brake application.

3.5 STOP INTERVAL

Distance or time between successive brake applications.

3.6 STOPPING DISTANCE

Distance vehicle travels from position where brake is applied to position where vehicle comes to a stop.

3.7 STOPPING TIME

Elapsed time between initial brake application and when vehicle comes to a stop.

3.8 TURF

A consistent and reasonably uniform grass covered surface. In this context, does not include root structure.

4. INSTRUMENTATION

Instrumentation is required to make the following observations:

a. Brake lever force with an accuracy of ±5%.

b. Specified vehicle speed with an accuracy of ±3 km/h (±2 mph).[1]

c. Actual vehicle speed with an accuracy of ±2 km/h (±1 mph).[2]

d. Stop interval with an accuracy of ±0.1 km (±0.05 mile) on distance, ±5 seconds on time.

e. Stopping distance or stopping time with an accuracy of ±5%.

[1] For example, if a test calls for an initial vehicle speed of 32 km/h (20 mph), a speed less than 29 km/h (18 mph) or more than 35 km/h (22 mph) is not acceptable.

[2] For example, a recorded actual speed of 34 km/h (21 mph) should be accurate within ±2 km/h (±1 mph).

f. Current time with an accuracy of ±30 seconds.

g. Ambient temperature with an accuracy of ±0.5 °C (±1 °F).

h. Deceleration (optional) - may be useful as a guide or indicator.

5. GENERAL INSTRUCTIONS

5.1 Brake Assembly

Brakes shall be prepared and adjusted in accordance with the vehicle manufacturer's standard specifications.

5.2 Vehicle Test Weight

Tests shall be conducted with the vehicle loaded to a test weight as determined by Equations 1 or 2:

$$W = C + 75(\pm 2)S \quad \text{(Eq. 1)}$$

where:

W = test weight, kg

C = curb weight, kg, which is the weight of the vehicle with standard equipment, including maximum capacity of fuel and oil with a total accuracy within ±2 kg

S = the vehicle's designed seating capacity

or

$$W = C + 165(\pm 5)S \quad \text{(Eq. 2)}$$

where:

W = test weight, pounds

C = curb weight, pounds, which is the weight of the vehicle with standard equipment, including maximum capacity of fuel and oil with a total accuracy within ±5 pounds

S = the vehicle's designed seating capacity

5.3 Test Conditions

5.3.1 Test Surface

5.3.1.1 Turf

Tests shall be conducted on a substantially level (not to exceed ±1% grade) turf, free of visible droplets of water. The turf shall not exceed 76 mm (3 inches) in height. When repeated testing results in visible deterioration of the test surface, testing should be moved to a new, unused area.

5.3.1.2 Snow Covered Surface

The surface of the ground shall be covered with a maximum of 75 mm (3 inches) of loose snow over a base consisting of at least 75 mm (3 inches) of snow sufficiently compacted to support the snowmobile without significant penetration.

The hardness of the snow surface shall be verified prior to testing by traversing the snowmobile over the test lane at a steady speed as slow as clutch engagement will allow and verifying at least 25 mm (1 inch) of track lug penetration. A track with less than a 25 mm (1 inch) lug shall have full lug penetration. Lug height is to be determined by measuring from the track belt to the maximum lug height.

5.3.2 Brake Lever Force

The brake force shall be applied in a manner equivalent to that shown in Figure 1. The effective brake lever force shall be applied at a point no more than 25.4 mm (1 inch) from the end of the control lever in a direction normal to the hand grip and in the plane of rotation of the control lever.

5.3.3 Test Speed

Vehicles shall be tested at the specified speed for each test. If the specified speed cannot be obtained, the test speed shall be the greatest achievable speed evenly divisible by 8 km/h (5 mph).

For example: if 61 km/h (38 mph) is the maximum speed achievable, the test speed for the 64 km/h (40 mph) requirement would become 56 km/h (35 mph).) If the maximum achievable speed is less than 8 km/h (5 mph), the test speed shall be 5 km/h (3 mph).

5.4 Test Observations

5.4.1 During all phases of testing, any unusual performance, such as grab, noise, or track skid, is to be noted and recorded. Also note and record any uncontrollable braking action causing the vehicle to lose stability, overturn, or swerve out of a test lane 1.2 m (4 feet) wider than the width of the vehicle.

5.4.2 Using stopping distance or stopping time as the test methods, deceleration shall be determined by Equations 3 and 4.

$$A = \frac{0.0386\,V^2}{S} \quad \left(A = \frac{1.075\,V^2}{S}\right) \tag{Eq. 3}$$

or

$$A = \frac{0.278\,V}{T} \quad \left(A = \frac{1.466\,V}{T}\right) \tag{Eq. 4}$$

where:

A = deceleration, m/s^2 (ft/s^2)

V = initial vehicle speed, km/h (mph)

S = stopping distance, m (feet)

T = stopping time, seconds

6. TEST PROCEDURE

The test procedure shall conform to the following:

6.1 Preburnish Check

6.1.1 Apply 400 N (90 lbf) to the brake lever and note any indication of component or assembly failure. Brake lever may yield or bottom on adjacent element after track is locked.

6.1.2 In order to allow for a general check of brakes, instrumentation, and vehicle operation, the following tests are to be run:

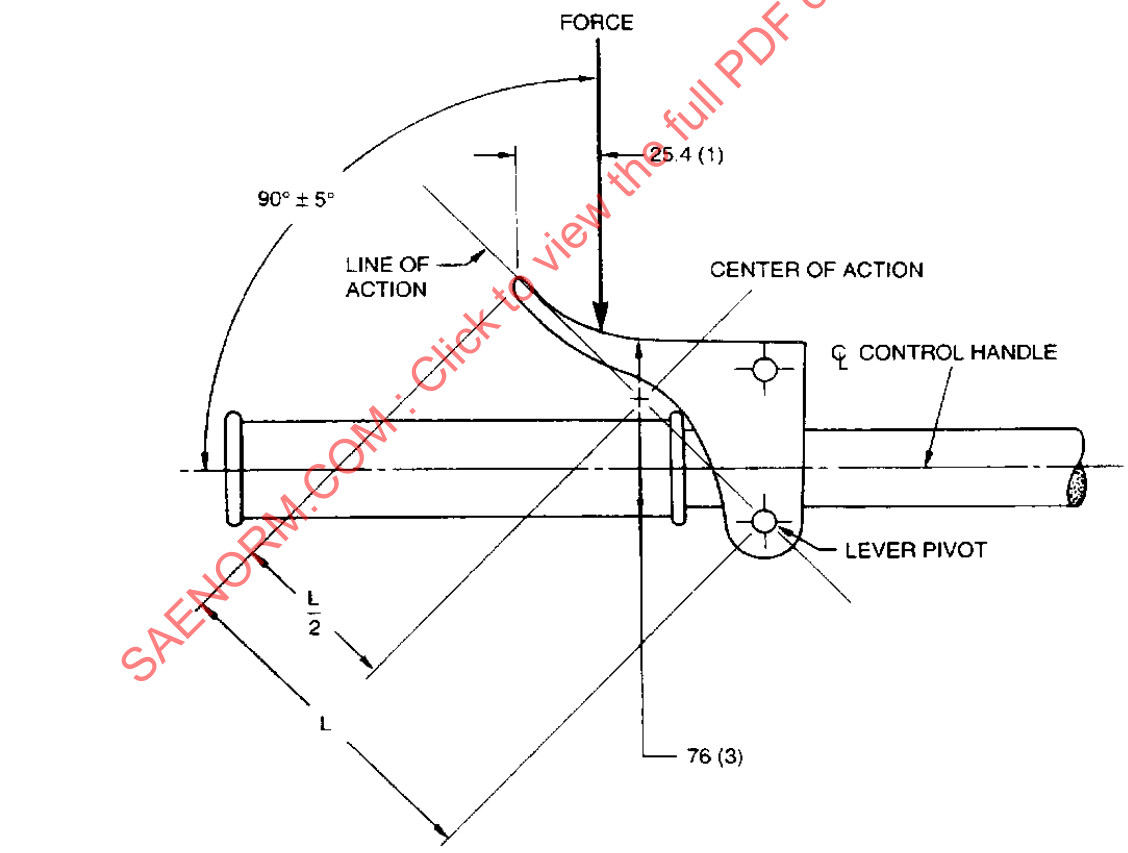
6.1.2.1 Conditions

a. Stops required: 5

b. Stop interval: 0.8 km (0.5 mile)

c. Initial vehicle speed: 48 km/h (30 mph)

d. Brake lever force: Determine the brake lever force to obtain a deceleration of 3 m/s^2 (10 ft/s^2)



NOTE—DIMENSIONS ARE MM (IN)

Figure 1 - Brake lever force