



Brakes – Snow/Ice Accumulation

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. To evaluate brake performance when the vehicle is subjected to snow conditions that may cause wheel freeze up.

1.2 Applicability. This procedure is applicable to passenger cars, multipurpose vehicles, and light trucks.

1.3 Remarks. Field experience shows that snow can accumulate on brake system components when the vehicle is driven in loose snow conditions. Heat from braking can partially melt this accumulated snow. Then if the vehicle is stationary at freezing ambient conditions, the melted snow can refreeze and cause wheel freeze up due to:

- a. Ice/snow buildup at or near the brake caliper,
- b. Brake drums frozen to the backing plate, or
- c. Brake friction material frozen to the brake friction surface.

The most frequent occurrence of wheel freeze up has been on rear disc brake systems. However, the phenomenon can occur on any brake system.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

None

2.3 Additional References.

GDM Global Document Management System (<https://documents.gm.com/gdm3/component/main>) (ID)

ID = This website is limited to internal use within General Motors and shall not be used outside this company. Contact the GM Lead Engineer for further instructions.

3 Resources

3.1 Facilities. Kincheloe GM Cold Weather Test Facility located in Kincheloe, Michigan or equivalent.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment.

3.2.1 Photograph or video equipment.

3.2.2 Brake pad thermocouples.

3.2.3 Thermocouple readout.

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3.3 Test Vehicle/Test Piece. Test vehicle with representative brake system, wheel, wheel housing, trim height, and front fascia.

3.4 Test Time.

Calendar time: 2 days to 5 days (with vehicle)

Test hours: 6 hours (drive and soak)

Coordination hours: 2 hours

3.5 Test Required Information. This test should be coordinated with other cold weather testing. The minimum cold soak time can be extended to overnight periods at the test facility. This test may have to be delayed until the needed road/snow conditions are available.

3.6 Personnel/Skills. Tester certified for testing at the facility.

4 Procedure

4.1 Preparation.

4.1.1 Install thermocouples at each brake corner in the friction material per test request.

4.1.2 Install the thermocouple readout within sight of the tester.

4.1.3 All instrumentation must be calibrated as required. Document instrumentation identification and calibration date in test record.

4.2 Conditions.

4.2.1 Environmental Conditions.

Note: The exact environmental conditions cannot be defined. However, the following conditions may be used as a guideline. The intent is to have snow conditions that push snow into the wheel well and temperature conditions that will refreeze snow partially melted by the heat of the brakes.

4.2.1.1 Ambient temperature should be a maximum of -1 °C for the drive portion of the test and drop to -12 °C for the soak.

4.2.1.2 The snow depth should be 100 mm to 200 mm.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.2.2.1 Engineering judgment should be used to determine if the environmental condition requirements for wheel lockup are present.

4.2.2.2 Tester is cautioned to not overdrive conditions. Vehicle control should be maintained at all times. Adjust vehicle speeds as necessary.

4.2.2.3 Longer soak times should be used if the ambient temperature is greater than -12 °C. Also, an overnight soak is acceptable.

4.2.2.4 A cold box may be used for the soak if snow conditions are acceptable but the ambient temperature is not cold enough.

4.2.2.5 A shaded area is preferred to eliminate any sun load effects.

4.2.2.6 The test record must contain the ambient temperature during the drive section, the initial brake temperatures, the vehicle speed, the number of miles (or time) driven, the temperature at the soak, and the length of the soak. The test record should contain as much detail about the snow conditions and the snow pack in the wheel areas as possible.

4.3 Instructions.

4.3.1 Check function of all instrumentation.

4.3.2 Conduct brake stops or snubs to raise the brake pad temperatures to between 95 °C and 105 °C.

4.3.3 Drive through snow areas at no more than 65 km/h for about 16 km.

4.3.4 After 16 km, stop vehicle and inspect brake corners and wheel area for snow accumulation. Use judgment to decide whether to proceed to the soak or to perform additional driving to increase the amount of snow pack.

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