



Brake Booster Vacuum Availability Drive Schedules for Repeated Brake Applies and Simulated Altitude

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. This procedure evaluates brake performance during drive schedules that may create a low booster vacuum condition, or limit vacuum replenishment.

1.2 Applicability. This procedure is applicable to all vehicles equipped with a vacuum assist brake apply system.

1.3 Remarks. This procedure was developed to evaluate brake performance for vehicles equipped with Active Fuel Management (AFM), formerly known as Displacement-on-Demand (DOD), powertrains. The drive schedules in this procedure are intended to flag any adverse braking effects during AFM engagement. This procedure may be used to evaluate any vehicle with a vacuum assist brake system where powertrain calibration may limit the available vacuum.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW15102

3 Resources

3.1 Facilities.

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.

3.1.3 Vehicle scales which are capable of measuring vehicle weight at each axle. Ballast materials.

3.1.4 Seven and two tenths percent (7.2%) grade access road between the North Circle and the Barnes Circle at the GM Milford Proving Ground (MPG), or equivalent.

3.1.5 Level, straight test road, such as the MPG North-South Straightaway.

3.1.6 MPG Circle Track or equivalent.

3.2 Equipment.

3.2.1 Engine vacuum transducer.

3.2.2 Brake booster vacuum transducer.

3.2.3 Brake pedal force transducer.

3.2.4 Decelerometer.

3.2.5 Fifth wheel.

3.2.6 Engine vacuum gage within sight of the test driver.

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3.2.7 Engine temperature signal within sight of the test driver.

3.2.8 Brake booster vacuum regulator or booster vacuum bleed valve.

3.2.9 Digital Data Acquisition System.

3.2.10 Optional: instrumentation to measure and record operation.

3.2.11 All instrumentation is to be calibrated as required. Instrumentation identification numbers and calibration dates shall be preserved in the test records.

3.3 Test Vehicle/Test Piece.

3.3.1 Test vehicle must be equipped with the test-intent brake system and powertrain.

3.3.2 New brake pads, linings, rotors, and drums are recommended. Instructions will include conditioning of new brake parts.

3.4 Test Time.

Calendar time: 3 days to 5 days

Test time: 8 h

Coordination time: 8 h

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. An experienced brake technician is required for vehicle set up and testing.

4 Procedure

4.1 Preparation.

4.1.1 Instrument the vehicle.

4.1.2 Arrange with MPG Traffic Safety to have the 7.2% grade access road connecting the North Circle to Barnes Circle closed for testing.

4.1.3 Thermocouple brake pads and linings following procedure in GMW15102.

4.1.4 Install new brake hardware.

4.1.5 Load vehicle to Gross Vehicle Weight Requirement (GVWR) with the load distributed in proportion to the maximum axle load requirements.

4.1.6 Perform a 200 stop brake burnish following instructions in GMW15102.

4.1.7 Load vehicle to Lightly Loaded Vehicle Weight (LLVW) maximum percent front loading condition.

4.2 Conditions.

4.2.1 Environmental Conditions.

4.2.1.1 The ambient temperature shall be any temperature between -20 °C and 40 °C.

4.2.1.2 Wind speed is limited to a maximum of 9 m/s.

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.

4.3 Instructions.

4.3.1 The 7.2% Downhill Driving Test.

4.3.1.1 Drive to the 7.2% grade access road at the North Circle. Use a driving route that will bring the engine to normal operating temperature, or 68 °C.

4.3.1.2 Turn onto 7.2% grade access road.

4.3.1.3 Begin data acquisition.

4.3.1.4 Accelerate at Wide Open Throttle (WOT) to an initial speed of 70 km/h.

4.3.1.5 Release throttle and allow vehicle speed to increase 5 km/h due to grade descent.

4.3.1.6 At 5 km/h above the initial speed, apply a quick ramp of the brake pedal to a deceleration of 1.96 m/s² (0.2G) to 2.45 m/s² (0.25G) and hold until the initial speed of 70 km/h is obtained.

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