



Chatter Bump Antilock Brake System Stopping Distance and Deceleration Uniformity

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. The purpose of this procedure is to test the Antilock Brake System (ABS) for stopping distance ratio of ABS stops on a uniform surface versus ABS stops over chatter bumps, and deceleration uniformity including no 'sail-on' effect while braking on chatter bump road surfaces. The ABS shall not produce a noticeable change in vehicle deceleration due to braking over chatter bumps. Vehicle shall meet the requirements in Table 1 while braking over 1.5 cm (height) by 18 cm (width) bumps spaced 70 cm apart centerline to centerline (located within 629 Chatter Bump area of Fenn Holden area at Milford Proving Ground (MPG)) or comparable road.

Table 1: Rough Road Surfaces

Requirement	Surface	Initial Speed	Stopping Distance Ratio
A	Chatter bumps	50 km/h	< 1.2
B	Chatter bumps	70 km/h	< 1.2

1.2 Applicability. This test procedure applies to any two-axle vehicle with pneumatic rubber tires for vehicles less than 4545 kg (10 000 lb) gross vehicle weight.

1.3 Remarks. This procedure is intended to quantify and subjectively compare stopping distance and deceleration uniformity between chatter bump surfaces and uniform surfaces. The required deceleration uniformity tests shall be performed at 50 km/h and 70 km/h on the 629 Chatter Bump area in the Fenn Holden Test area at MPG (or comparable road). This procedure is also intended to subjectively evaluate the system for deceleration uniformity and no 'sail-on' effect over chatter bump surfaces. Subjective evaluations will be performed if a degradation in deceleration uniformity performance is observed and/or a sail-on condition is observed during the required testing.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14264

2.3 Additional References. None.

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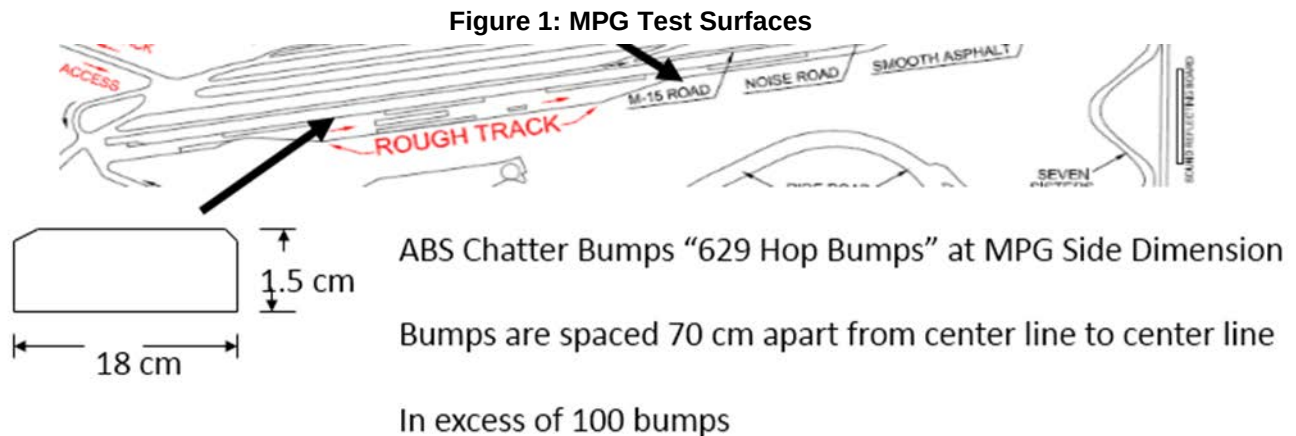
December 2015

Page 1 of 7

3 Resources

3.1 Facilities.

- Laboratory for test vehicle build instrumentation installation.
- Vehicle weight station capable of measuring vehicle weight at each corner.
- Test surfaces as are located at Fenn Holden and the Ride and Handling Loop, or equivalent. As described in Figure 1:



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 Brake pressure sensors located at each corner.

3.2.2 Vehicle steering wheel angle sensor.

3.2.3 Longitudinal accelerometer at vehicle's center of gravity ($\pm 1.25g$).

3.2.4 Wheel speed sensors at each corner.

3.2.5 Brake pedal force transducer.

3.2.6 Brake pad temperature measuring equipment at each corner.

3.2.7 Speed measurement device with capability to capture initial speed and distance. The speed transducer must be capable of reading velocity in excess of the vehicle test speed; a minimum of 150 km/h is recommended. The transducer accuracy must be within 0.5 km/h over the speed range of 5 km/h to 150 km/h. The transducer accuracy shall measure distance within $\pm 2\%$.

3.2.8 Sample rate is 10 ms (100 Hz).

3.3 Test Vehicle/Test Piece. Refer to Section 4.

3.4 Test Time.

Calendar time: 1 day

Test time: 4 hours

Coordination time: 2 hours

Instrumentation time: 1.5 days

3.5 Test Required Information. Refer to Section 4.

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December 2015

Page 2 of 7

3.6 Personnel/Skills.

3.6.1 Experienced chassis test technician for vehicle instrumentation.

3.6.2 Chassis test driver certified for handling tests.

4 Procedure

4.1 Preparation.

4.1.1 The vehicle to be tested must be in safe operating condition for maneuvering levels approaching the limit of vehicle performance. Condition of tire, brake and suspension components should be inspected carefully. All vehicle safety equipment must be in proper operating condition.

4.1.2 Information about the vehicle and the last brake system should be stored with the test data.

4.1.3 **Tires and Brakes.** The requesting engineer shall specify tires and tire condition. New tires are recommended. The requesting engineer shall also specify the brakes and the brake condition.

4.1.4 **Instrumentation.** All instrumentation must be securely fastened to the vehicle due to the nature of test maneuver. Instrumentation should be located on the passenger or rear seats to avoid excessive ballast in the rear of the vehicle.

Install transducers, data acquisition, driver readouts and steering control equipment. Accelerometers should be mounted as near the center of gravity as possible. Mount the speed measurement device as close to the vehicle centerline as possible.

4.1.5 **Load Vehicle to Test Configuration.** Curb plus driver plus instrumentation plus full fuel load plus any required safety equipment loading is recommended. The requesting engineer may specify other loading conditions. All ballast must be properly secured. Record vehicle test weight.

4.1.5.1 Inflate tires to manufacturers recommended pressure or per test engineer's instructions.

4.2 Conditions.

4.2.1 **Environmental Conditions.** Wind speed should be less than 24 km/h.

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.

4.2.3 Test surfaces should be free of debris.

4.3 Instructions.

4.3.1 Required test speeds and surfaces are as follows in Table 2:

Table 2: Required Chatter Bump Tests

Surface	Test Speed(s)
629 Chatter Bump surface at Fenn Holden (or equivalent)	Requirement A: 50 km/h Requirement B: 70 km/h
Smooth Surface at Fenn Holden adjacent to 629 Chatter Bump surface (or equivalent)	Requirement A: 50 km/h Requirement B: 70 km/h

4.3.2 Other speeds may be specified to suit the vehicle/surface combination depending on facility, vehicle or safety constraints.

4.3.3 Verify that all instrumentation is functioning properly. Calibrate instrumentation as necessary.

4.3.4 At 50 km/h test speed, perform Spike Brake Apply inducing ABS on the 629 Chatter Bump surface.

4.3.5 At 50 km/h test speed, perform Spike Brake Apply inducing ABS on the smooth surface adjacent to the 629 Chatter Bump surface.

4.3.6 Repeat 4.3.4 and 4.3.5 four (4) times for a total of eight (8) runs at the given test speed, (four (4) runs on each surface).

4.3.7 Repeat 4.3.3 thru 4.3.6 at 70 km/h.

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December 2015

Page 3 of 7