



Brake Assembly Durability During Tramp Resonance on Chassis Rolls

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 determine the durability life characteristics of front or rear brake assemblies during tramp resonance.

1.2 Applicability. This standard is applicable to all passenger cars, multipurpose passenger vehicles, and light-duty trucks.

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.

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

(ID)=This website is limited to internal access within General Motors and shall not be accessed outside this company. Contact the GM Lead Engineer for further information.

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 Chassis rolls facility with pneumatic or hydraulic capability. Rolls are equipped with bump lobes 12.7 mm × 76.2 mm (0.5 in × 3.0 in), 180 degrees apart, left hand and right hand rolls 90 degrees out of phase. See Figure A1 in Appendix A for picture of typical facility.

3.1.4 Bedplate, 127 mm × 305 mm (5 ft × 12 ft) or as determined by buck size.

3.2 Equipment.

3.2.1 One (1) sheet metal buck, frame assembly, or equivalent fixturing (preferred) to mount brakes and relevant suspension components.

3.2.2 Angle stands with adjustable angle stand brackets to mount the setup to the bedplate.

3.2.3 All relevant suspension components and attachment hardware required to mount brake assemblies. Shock absorbers are not required unless part of suspension structure (such as McPherson strut), in which case, shock absorber must be drained of damping oil.

3.2.4 Two (2) representative wheels with tires.

GM Confidential

© Copyright 2016 General Motors Company All Rights Reserved

December 2016

Page 1 of 5

3.2.5 One (1) complete steering linkage assembly with steering gear locked in the straight-ahead position.

3.2.6 One (1) set of brake lines.

3.2.7 Hydraulic or pneumatic actuator fixtured to exert hydraulic pressure in brake lines through a brake master cylinder including required controls and fixtures.

3.2.8 Controller, safety switches as required.

3.2.9 Safety guards to enclose rotating portion of test as required.

3.2.10 Accelerometers per test request.

3.2.11 All instrumentation is to be calibrated as required. Record instrumentation details and calibration dates in test record.

3.3 Test Vehicle/Test Piece. Six (6) brake assemblies, three (3) left-hand and three (3) right-hand.

3.4 Test Time.

Calendar time: 6 days to 12 days

Test hours: Dependent on speed

Coordination hours: 4 hours to 8 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Brake technician or engineer trained to perform the instructions in Section 4.

4 Procedure

4.1 Preparation.

4.1.1 Perform magnetic particle inspection on all brake samples. Reject flawed samples.

4.1.2 Install suspension components to sheet metal buck, frame assembly, or equivalent fixturing and mount brake assemblies, wheels and tire to suspension. Adjust tire pressure per test request.

4.1.3 Mount sheet metal buck, frame assembly, or equivalent fixturing on chassis rolls through angle stands and brackets, positioning so that suspension is held at design height.

4.1.4 Install brake lines and connect to master cylinder fixture.

4.1.5 Mount steering linkage with steering gear locked in the straight-ahead position. (For front brake assembly test only).

4.1.6 Install a hydraulic or pneumatic actuator of brake system. Adjust equipment to give a 685 kPa brake pipe pressure for 0.5 s/cycle through the master cylinder.

4.1.7 Install safety switches to shut test down when the tire moves 25 mm (1 in) laterally inboard or outboard.

4.1.8 Install accelerometers per test request.

4.1.9 Mount safety guards as required.

4.1.10 Confirm installation of bump lobes in 3.1.3.

4.2 Conditions.

4.2.1 Environmental Conditions. Indoor laboratory environment is required.

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 Start rolls and adjust speed to put suspension into resonance. Measure the roll speed. On the test record, make a note of the roll speed, measured in rpm.

4.3.2 Brake apply cycle time (time between brake applications) is calculated as follows. The brake apply cycle time assumes 3500 brake applications per 2 000 000 bump cycles.

$$\text{Cycle Time (s)} = \frac{17\,142}{\text{Roll speed at Resonance (rpm)}}$$

4.3.3 Adjust controls to cycle brake line pressure as specified in 4.3.2.

GM Confidential

© Copyright 2016 General Motors Company All Rights Reserved

December 2016

Page 2 of 5