GM WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW15647

Truck Suspension Impact Brake Test

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 evaluate the structural integrity of the front suspension, rear suspension and steering linkage with repeated brake applications.

1.2 Applicability. This test procedure applies to trucks only.

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

3 Resources

3.1 Facilities. General Motors Proving Ground, Mesa, AZ: Milford, MI, 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 Ballast sufficient to ballast vehicle to Gross Vehicle Weight Rating (GVWR).

3.2.2 Precision vehicle speed indicator.

3.2.3 Calibrated speedometer.

3.2.4 Record and transducer for pedal force deceleration and line pressure.

3.2.5 Brake apply device capable of applying the pedal force and rate of application desired (manual apply method optional).

3.2.6 Front end alignment equipment.

3.2.7 Tire pressure gauge.

3.2.8 Vehicle equipped with power steering, manual or power brakes and largest inertia tires and wheels released by the manufacturer and all factory installed options weighing more than 2.3 kg per test requester.

3.2.9 New brake pads, rotors, shoes and drums, per test requester.

Note: All instrumentation is to be calibrated as required; record instrumentation details and date of calibration on data sheet unless the information is otherwise preserved in the testing laboratory records.

3.3 Test Vehicle/Test Piece. Vehicle instrumented, per 3.2.

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3.4 Test Time.

Calendar time:	7 d
Test time:	40 h
Coordination time:	16 h

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. The test technician should be familiar with the test machine and the instrumentation required to obtain test data

4 Procedure

4.1 Preparation.

4.1.1 Set vehicle to curb weight per test requester.

4.1.2 Set vehicle to curb Z – D heights per test requester.

4.1.3 Set tire pressure per test requester.

4.1.4 Set and record front and rear wheel alignment to mean specifications per test requester.

4.1.5 Record front and rear wheel alignment at held heights.

4.1.6 Tighten backing plate to knuckle attachment fasteners for drum brakes; caliper assembly to knuckle attachment bolts for disc brakes per test requester. Record results on Appendix A, Data Sheet A1.

4.1.7 Adjust brakes to manufacturer's specifications, per test requester.

4.1.8 Fastener Monitoring: All fasteners secured by the test lab should be torqued to minimum specification and recorded. Apply paint pen, Torque-Seal, or equivalent for indexing all fasteners. During test, and at end of test, report observations where fastener is off scribe and/or Torque-Seal is compromised (e.g., broken) noting the specific attachment location. End of test breakaway torques in the on direction should be measured and recorded for all joints.

4.1.9 Prick punch marks and measure any pertinent or test components.

4.1.10 Ballast truck to Gross Vehicle Weight (GVW), distributed in proportion to axle ratings without exceeding axle ratings per test requester.

4.1.11 Set tire pressures per test requester.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

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 Refurnish impact brake application.

4.3.1.1 Make ten (10) stops from 48 km/h (30 mph) in driving gear at 1.6 km (1 mi) intervals with a deceleration rate of 3 m/s^2 (10 ft/s^2) Acceleration to cooling speed at 16 km/h (10 mph) is to be 1.52 m/s^2 (5 ft/s^2).

4.3.1.2 Make and record one (1) impact brake application (pedal force and application rate at description of requesting engineer) from 48 km/h (30 mph) and immediately drive 0.8 km (0.5 mi) and make one (1) impact brake application from 96 km/h (60 mph). Brake applications to be made until all four (4) wheels lock up or stop occurs, then release.

4.3.1.3 Record pedal force vs. handling characteristics of the vehicle during the test.

4.3.1.4 Comment on any unusual handling characteristics of the vehicle during the test.

4.3.1.5 Measure and record front camber, caster, toe-in and rear camber and toe-in at held heights.

4.3.1.6 Inspect brakes for lining retention and integrity.

4.3.2 Burnish.

4.3.2.1 Make 200 burnish stops from 64 km/h (40 mph) at 4 m/s^2 (12 ft/s^2) according to the following intervals based on ambient temperature:

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Burnish Stop Intervals by Ambient Temperature

Ambient Temperature		Distance Interval		Approximate Time Interval
(C)	(F)	Kilo-meters	Miles	Seconds
< 2	< 35	0.8	0.5	50
2 to 7	36 to 45	1.0	0.6	60
7 to 13	46 to 55	1.1	0.7	70
13 to 19	56 to 65	1.3	0.8	80
19 to 24	66 to 75	1.4	0.9	90
24 to 30	76 to 85	1.6	1.0	100
30 to 35	86 to 95	1.8	1.1	110
35 to 41	96 to 105	1.9	1.2	120
41 to 47	106 to 115	2.1	1.3	130

4.3.2.2 Record percent of brake lining contact area.

4.3.2.3 Adjust brakes to manufacturer's specifications.

4.3.3 Post burnish impact brake application.

4.3.3.1 Record pedal force vs. time for each impact brake application executed in the following items. Decelerations vs. time and line pressure recordings are optional recordings.

4.3.3.2 Make one (1) impact brake application at 1.6 km (1 mi) intervals from the following speeds: 16 km/h, 48 km/h, 96 km/h (10 mph, 30 mph, 60 mph).

4.3.3.3 Make a 48 km/h (30 mph) stop at 3 m/s^2 (10 ft/s^2) as a general check of the brakes and the vehicle. Inspect and record any irregularities.

4.3.3.4 Make two (2) impact brake applications in reverse from 16 km/h (10 mph).

4.3.3.5 Repeat 4.3.3.3.

4.3.3.6 Check and record front and rear end alignment at held heights.

4.3.3.7 Make two (2) forward impact braking applications from 16 km/h (10 mph).

4.3.3.8 Repeat 4.3.3.3.

4.3.3.9 Make three (3) impact braking applications from 96 km/h (60 mph) at 1.6 km (1 mi).

4.3.3.10 Repeat 4.3.3.3.

4.3.3.11 Record front camber, caster and toe-in and rear camber and toe-in curb and held heights.

4.3.3.12 Take the posttest measurements of prick punched or marked components.

4.3.3.13 Inspect steering linkage, front and rear suspension and brakes. Record any irregularities.

4.3.3.14 Check and record all fastener torques in the tightening direction (e.g., breakaway-on direction).

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Not applicable.

5.3 Test Documentation. A test report documenting the vehicle description, test conditions, and test results is required. Sample data sheets are shown in Appendix A, Data Sheets A1 and A2.

6 Safety

This standard may involve hazardous materials, operations, and equipment. This standard does not propose to address all the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

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