



## **Truck Suspension Impact 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 test procedure is to evaluate the impact strength of front and rear suspension assemblies and their interfaces to the frame/body during extreme loading.

**1.2 Applicability.** This test procedure applies to trucks only. This product assurance test generates extreme loads and should not be run unless a new design or significant design changes are to be evaluated. Contact the Suspension Subsystem Bill of Material (BOM) Family Owner (BFO) for agreement that test is appropriate.

### **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.** Milford Proving Ground (MPG) maintains a facility with a tie spacing of 198 cm (79 in). The maximum tie spacing should be 215 cm (86 in).

**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** Test vehicle.

**3.2.2** Ballast sufficient to ballast vehicle to curb mass plus 50% payload. Payload is defined as Gross Vehicle Mass Rating (GVMR) less curb mass.

**3.2.3** Wheel alignment equipment.

**3.2.4** Torque wrench.

**3.2.5 Optional:** Crack detecting equipment at the request of the Test/Requesting Engineer.

**Note:** All instrumentation is to be calibrated as required; record instrumentation details and date of calibration on Data Sheet A4 (Appendix A) unless the information is otherwise preserved in the testing laboratory records.

**3.3 Test Vehicle/Test Piece.** The vehicle as described in 3.2.

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### 3.4 Test Time.

Calendar time: 2 days to 5 days

Test time: 8 h to 24 h

Coordination time: 8 h to 16 h

**3.5 Test Required Information.** Not applicable.

**3.6 Personnel/Skills.** Test personnel shall be trained and qualified to perform this procedure.

## 4 Procedure

### 4.1 Preparation.

**4.1.1** Inspect front, rear suspension components and frame/body interfaces for cracks. Do not begin test before resolving any existing crack with Requesting Engineer.

**4.1.2** Check and record vehicle trim heights.

**4.1.3** Check and set the wheel alignment to specification.

**4.1.4** Test/Requesting Engineer to provide fasteners and fastener tightening specifications. Request to be monitored on test Data Sheet A2 (Appendix A).

**4.1.5 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.

**4.1.6** Ballast the vehicle to curb mass plus 50% payload. Payload is defined as GVWR less Curb Mass.

**4.1.7** Set tire pressure to sidewall rating. (Maximum pressure.)

**4.1.8** Calibrate vehicle speedometer at loaded weight.

### 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.

Test speeds, railroad tie height, and number of impacts in this procedure are recommendations only.

The Test/Requesting Engineer, based on vehicle program requirements, shall specify deviations from the requirements of this test procedure.

### 4.3 Instructions.

**4.3.1** At a speed of 32 km/h (20 mph), drive the ballasted vehicle over the two (2), 152 mm (6 in) railroad ties, with only the left front and left rear wheels contacting the ties, at an angle of 75 degrees to the path of travel. See Figure 1. Repeat for fifteen (15) impacts. Visually inspect components and interfaces every five (5) impacts. Record observations as an accurate record of test progression.

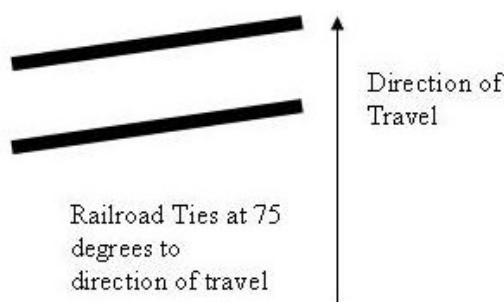


**Figure1: Test Layout**

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**4.3.2** Drive the ballasted vehicle over three (3), 152 mm (6 in) railroad ties, with the left front and left rear wheels contacting the two (2), 152 mm (6 in) ties; and the right front and right rear wheels passing over the other 152 mm (6 in) railroad tie. The wheels should contact the ties at an angle of 90 degrees to vehicle travel at a speed of 32 km/h (20 mph). Repeat for 25 impacts. Visually inspect components and interfaces every five (5) impacts. Record the observations to maintain an accurate record of test progression.

**4.3.3** Drive the ballasted vehicle over three (3), 152 mm (6 in) railroad ties in the same manner as in 4.3.2, except as front wheel initially contacts a first tie, apply brakes moderately while maintaining a vehicle speed of 32 km/h (20 mph) with the accelerator. Repeat for ten (10) impacts. Visually inspect components and interfaces every 5 impacts. Record the observations to maintain an accurate record of test progression.

**4.3.4** Remove ballast from vehicle.

**4.3.5** Record the trim heights.

**4.3.6** Record wheel alignment. Realign the vehicle if it is out of alignment specifications. Record if realignment is not possible.

**4.3.7** Inspect fasteners, record any broken index marks and record component torques.

**4.3.8** Inspect test components and interfaces for deformation and/or cracks.

**4.3.9 General Information.** Test material should complete the railroad tie impacts without loosening, bending or breaking, and front alignment and heights should remain within tolerances or be able to be returned to specification with normal service procedures.

## 5 Data

**5.1 Calculations.** Not applicable.

**5.2 Interpretation of Results.** The results should be compared to applicable technical specifications. The results of the inspection and measurement of any deformation and/or cracks, and photographs should be used to determine potential issues.

**5.3 Test Documentation.** A test report documenting the vehicle description, test conditions, and test results is required. Sample Data Sheets A1 through A4 are shown in Appendix A.

## 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.

In general, a risk assessment needs to be performed for every driving instruction prior to executing this standard. (**Note:** National law needs to be considered while performing a risk assessment.) The required rating of risk by exposure probability and possible violation will be done in a separate document. Every identified risk must be named inside the risk assessment for the relevant driving instruction in order to announce that risk to employees. Within the risk assessment, the vehicle equipment and different vehicle build stages have to be considered. After performing a risk assessment, non-acceptable risk needs to be mitigated by appropriate countermeasures. Here technical measures are preferred because these are independent from attendant circumstances. In case technical measures are not appropriate, organizational and/or personal measures will apply. This includes training, wearing of Personal Protection Equipment, or arrangement of idle time.

### 6.1 Safety Precautions.

**6.1.1** Instrumentation and other test equipment must be securely mounted in accordance with proving grounds traffic safety guidelines for mounting and usage of in-vehicle instrumentation.

**6.1.2** All running lights and vehicle safety features must be operational according to proving grounds rules for running lights and power windows. Exterior lights must not be obscured by styling add-ons, covers or camouflage packages. The horn may be disabled because of steer angle transducer installation.

**6.1.3** A helmet is required in accordance with the regulations of the test facility. The vehicle should never be operated in a manner where the vehicle leaves the roadway or goes onto the shoulder for any reason.

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