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Standard Specification for Trailers Used for Measuring Vehicular Response to Road Roughness[1]

This standard is issued under the fixed designation E 1215; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This document specifies the design, performance, and operating features of a trailer used for measuring response to road roughness.

1.2 The specified trailer is a two-wheeled, single-axle vehicle that is towed on highways at typical traffic speeds while the relative movement between the axle and body is transduced and recorded as an indication of road roughness.

1.3 The instrumentation for sensing the movements of the trailer is not covered in this specification. One example of instrumentation is described in Test Methods E 1082.

1.4 The values stated in inch-pound units are to be regarded as the standard.

1.5 The following caveat pertains only to Section 5 of this specification: *This standard does not purport to address all of the safety concerns, if any, 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.*

2. Referenced Documents

2.1 *ASTM Standards:*

E 1082 Test Methods for Measurement of Vehicular Response to Traveled Surface Roughness[2]

E 1136 Specification for a Radial Reference Test Tire[2]

2.2 *Other Document:*

A4082 TPC Tire Performance Criteria, Procedures and Specifications[3]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *sprung mass*—the total mass minus the unsprung mass.

3.1.2 *suspension deflection*—the change in the vertical distance between the axle at its centerline and a hypothetical reference line directly above the axle centerline on the rigid frame structure.

4. Other Requirements

4.1 *Damping Ratio of Suspension System*—The damping ratio of the suspension system on the assembled trailer shall be evaluated by measuring the accumulated suspension movement on the trailer as it is towed over a known or standard calibration test surface. It must be verified that it meets one of the acceptance criteria.[3] The design requirements for the shock absorbers (5.1.1.3) may be used as an alternative to this requirement.

4.2 *Spring Rate*—The spring force constant (spring rate) of the assembled suspension shall be measured as follows:

4.2.1 *Apparatus*:

4.2.1.1 *Dial Indicators*, with a nominal accuracy of 0.001 in. (0.025 mm). Two are required.

4.2.1.2 *Loading Weights*, permitting load increments of approximately 20 lbf (89 N) are required.

4.2.2 *Procedure*—Measure the vertical deflections of the suspension by placing the dial indicators at points proximate to the coil springs. With the trailer parked on a level surface, gently apply the weights, in approximately 20-lbf (89-N) increments, on the longitudinal centerline of the trailer directly above the centerline of the axle while recording the suspension deflection values observed on each dial indicator. Take care not to jar the trailer when applying the weights. Once all the weights have been applied up to the total mass, remove them in the same manner while recording the deflection measurements at each increment.

4.2.3 *Data Reduction*—Separately plot the load-deflection values for each suspension system (left and right) on rectilinear graph paper. Draw a straight line that best reflects the slope of the upward (loading) and downward (unloading) data points, ignoring the initial data point if necessary. The slope of that line is the spring rate and must fall within the range of 180 to 220 lbf/in. (32 to 39 N/mm).

4.3 *Legal Requirements*:

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[1] This specification is under the jurisdiction of ASTM Committee E-17 on Vehicle-Pavement Systems and is the direct responsibility of Subcommittee E17.31 on Methods for Measuring Profile and Roughness.

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[2] *Annual Book of ASTM Standards*, Vol 04.03.

[3] Available from General Motors Engineering Staff, GM Proving Ground, Milford, MI 48042.

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