



SURFACE VEHICLE RECOMMENDED PRACTICE

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Recommended Guidelines for Load/Deformation Testing of Elastomeric Components

RATIONALE

This recommended practice covers technology and procedures which are mature and not likely to change in the foreseeable future.

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Foreword—These guidelines describe:

- a. The basic behavior of elastomeric components subject to changing loads or deformations
- b. Definition of a test method to meet specific requirements and a set of definitions and terminology to allow interchange of information on a common basis
- c. Important considerations in the evaluation and reporting of test information

1. Scope—The purpose of this SAE Recommended Practice is to review factors that influence the behavior of elastomeric components under conditions of loading or deforming at a constant rate and to provide guidance concerning test procedures used to define or specify the load/deformation characteristics of elastomeric components. This characteristic is referred to as Static Stiffness. This is also referred to as a "Static Deflection Test."

2. References

2.1 Applicable Publication—The following publication forms a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1883 MAR88—Elastomeric Bushing "TRAC" Application Code

3. Elastomeric Behavior—An elastomer is a viscoelastic material. It acts as though it were composed of an elastic component and a viscous component. The elastic component controls stress versus strain behavior. Because of an elastomer's viscoelastic nature, the dynamic response and mechanical behavior are dependent upon stress or strain history, rate of deformation, level of strain, and specimen temperature.

4. Specimen History—Prior to testing it is important to know if the component has experienced any mechanical preflexing or temperature changes and to know the timing of these influences. This is necessary for consistency in comparing test results.

- 4.1 Mechanical Preflexing**—It is well known that elastomers undergoing load/deformation tests will progressively change for up to the first 1000 cycles until a steady-state condition is reached. Depending on the elastomer, this change ranges from about 3 to 25%. It is also known that most of the stiffness on the first cycle can be regained if a period of about 8 h or more elapses between load deflection tests. Consequently, preflexing influences must be considered. For preflexing to be effective, the load and/or deflection must be at least that at which the stiffness is to be determined.
- 4.2 Temperature Changes**—Since elastomers are viscoelastic materials, it is necessary to know the temperature of the specimen and its temperature history prior to testing. Storing a specimen in a very cold or hot atmosphere prior to testing will influence the static data in mechanical testing as well as the time to wait before regaining the first static data after preflexing.
- 4.3 Aging**—Assembled components require sufficient time for the elastomeric material to integrate effects such as assembly oil or precompression. One week is recommended. Oven aging for 3 h at 70 °C is sometimes used as a substitute for natural aging. This serves to yield more uniform results.
- 5. Test Setup**—The type and manner of fixturing a component for evaluation greatly affects the validity of the measured data. The geometry and loading procedure for each fixture should be clearly specified.
- 5.1 Axial**—The test fixture must maintain any predefined relationship between the source of loading or deformation and the component under test during the entire test sequence.
- 5.2 Rotational**—For evaluation of components in rotational modes (i.e., torsional or conical) it will be necessary to specify the mode of loading as rotational with a torque and center of rotation (provides rotation input only) or linear with a force and lever arm (provides rotation and translational inputs). Care should be taken to maintain the predefined geometrical relationships between the fixturing and the component under test during the entire test sequence. Please refer to SAE J1883 for assistance in the definition of the geometric environment for any particular test.
- 6. Test Sequence**—Each test typically consists of a pretest period and a test period.

The pretest period is used to apply a preload level and cyclic loads or displacements to the specimen prior to data acquisition. During the pretest period, ramp to the preload level, perform precycles, ramp back to the preload level, and then maintain the preload level for a hold period. Each precycle consists of a ramp to Precycle Level 1 followed by a ramp to Precycle Level 2.

The test period is used for data acquisition. From the preload level, ramp to Test Level 1 to Test Level 2 and back to Test Level 1. Typically, data is acquired from Test Level 1 to Test Level 2 then back to Test Level 1. (See Figure 1.)

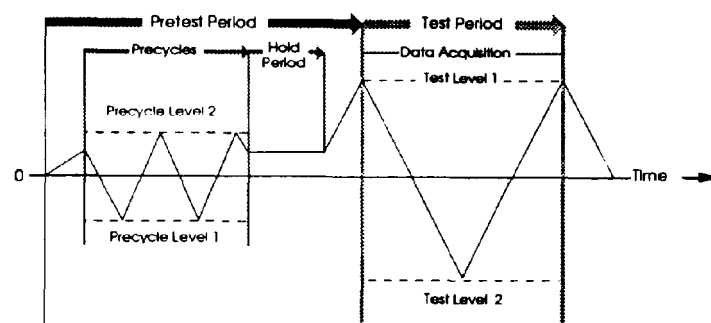


FIGURE 1—SIMPLIFIED TEST LAYOUT