



Designation: D 2991 - 84

AMERICAN SOCIETY FOR TESTING AND MATERIALS

1916 Race St., Philadelphia, Pa. 19103

Reprinted from the Annual Book of ASTM Standards, Copyright ASTM
If not listed in the current combined index, will appear in the next edition.

Standard Practice for Testing STRESS-RELAXATION OF PLASTICS¹

This standard is issued under the fixed designation D 2991; 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 practice covers the determination of the time-dependence of stress (stress relaxation) of plastics resisting long-duration constant strains at conditions of constant temperature and relative humidity and negligible vibration.

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

2. Applicable Documents

2.1 ASTM Standards:

D638 Test Method for Tensile Properties of Plastics²

D695 Test Method for Compressive Properties of Rigid Plastics²

3. Definitions

3.1 *stress relaxation*—the time-dependent decrease in stress in a solid under given constraint conditions.

3.2 *initial stress*—the stress introduced into a specimen by imposing the given constraint conditions before stress relaxation takes place.

4. Significance and Use

4.1 Data from stress-relaxation tests are useful in predicting the reduction of stress in materials subjected to constant deformation for long times, such as the decrease in tightness of bolted or riveted joints.

4.2 This test is highly sensitive to small changes in material composition and environ-

mental conditions and hence is useful in evaluating the effect of such changes.

5. Grips

5.1 The grips and gripping technique shall be designed to minimize eccentric loading of the specimen. Swivel or universal joints shall be used beyond each end of the specimen. The grips shall be so designed that no slippage of the specimen occurs.

NOTE 1—It is recommended that grips permit the final centering of the specimen prior to applying the strain or load. Grips that permit a displacement of the specimen within the grips during load application are not suitable.

6. Temperature Control and Measurement

6.1 The temperature of the test space, especially close to the gage length of the specimen, shall be maintained within $\pm 2^\circ\text{C}$ by a suitable automatic device and shall be stated in reporting the results.

NOTE 2—The thermal contraction and expansion associated with small temperature changes during the test may produce changes in the apparent relaxation rate especially near transition temperatures. Small changes in temperature near transitions also produce significant changes in relaxation rate.

6.2 Care must be taken to ensure accurate temperature measurements over the gage length of the specimen throughout the test. The temperature-measuring devices shall be checked reg-

¹ This practice is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.10 on Mechanical Properties.

Current edition approved Nov. 30, 1984. Published January 1985. Originally published as D 2991 - 71. Last previous edition D 2991 - 71(1978). This practice and Methods D 2990 replace Recommended Practices D 674, which have been discontinued.

² *Annual Book of ASTM Standards*, Vol 08.01.