Designation: D 1338 – 99

Standard Practice for Working Life of Liquid or Paste Adhesives by Consistency and Bond Strength[1]

This standard is issued under the fixed designation D 1338; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This practice covers two procedures applicable to all adhesives having a relatively short working life. It is intended to determine whether the working life conforms to the minimum specified working life of an adhesive required by consistency tests or by bond strength tests, or by both.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are provided for information purposes only.

1.3 *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:*

D 897 Test Method for Tensile Properties of Adhesive Bonds[2]

D 906 Test Method for Strength Properties of Adhesives in Plywood Type Construction in Shear by Tension Loading[2]

D 907 Terminology of Adhesives[2]

D 1002 Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal)[2]

D 1084 Test Methods for Viscosity of Adhesives[2]

3. Terminology

3.1 *Definitions*—Many terms in this practice are defined in Terminology D 907.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *working life of an adhesive*—the time elapsing between the moment an adhesive is ready for use and the time when the adhesive is no longer usable.

4. Significance and Use

4.1 To determine acceptable working life of an adhesive, two procedures are used. This practice is intended to apply to:

4.1.1 Self-contained liquid or paste adhesives,

4.1.2 Adhesives requiring addition of a catalyst, hardener, filler, thinner, and so forth, or combinations of two or more of these materials just prior to use, and

4.1.3 Powdered or flaked adhesives which are dissolved in water or other solvent and are used as liquid or paste adhesives.

CONSISTENCY PROCEDURE

5. Apparatus

5.1 *Viscometer*—Any means of measuring the viscosity or consistency of the adhesive can be selected, provided that it is suitable for the type of adhesive under test and provided that the results can be expressed in fundamental units.

5.2 *Controlled-Atmosphere Chamber*—Provide an atmosphere of 23 ± 1.1°C (73.4 ± 2°F) and 50 ± 2 % relative humidity. Alternative controlled conditions are permissible, provided the conditions are agreed upon by the purchaser and the manufacturer.

5.3 *Beaker*, of heat-resistant glass,[3] 76 mm (3 in.) in diameter, 102 mm (4 in.) high, and having a capacity of 400 mL.

5.4 *Stirring Rod*, of glass, stainless steel, or other unreactive material.

6. Procedure

6.1 Conduct the consistency test on both the adhesive when freshly prepared and on the adhesive after having been subjected to the working life test.

NOTE 1—An alternative test method to be used with this practice is Test Methods D 1084.

6.2 Precondition the adhesive and all the components at a temperature of 23 ± 1.1°C (73.4 ± 2°F), unless otherwise agreed upon between the purchaser and the manufacturer.

6.3 Start the test when the adhesive and all the components are at a temperature of 23 ± 1.1°C (73.4 ± 2°F), unless otherwise agreed upon between the purchaser and the manufacturer. If the adhesive consists of two or more components, blend the components in accordance with instructions of the manufacturer, and again adjust the temperature to 23 ± 1.1°C

[1] This practice is under the jurisdiction of ASTM Committee D-14 on Adhesives and is the direct responsibility of Subcommittee D14.10 on Working Properties.

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[2] *Annual Book of ASTM Standards*, Vol 15.06.

[3] Borosilicate glass is suitable for this purpose.

if required. Immediately after mixing a 200-mL (or equivalent weight) sample of the adhesive, place the prepared adhesive in the 400-mL beaker.

6.4 Record the time at the moment the adhesive is placed in the beaker and is ready for use. Unless otherwise agreed upon between the manufacturer and the user, keep the beaker uncovered throughout the test. After a 10-min interval has elapsed, place a glass stirring rod (6 mm (¼ in.)) in diameter and long enough to be handled conveniently in the center of the beaker touching the bottom of the beaker. Rotate the glass rod in this position with a spiral motion, moving outwardly towards the wall of the beaker.

6.5 Make five complete revolutions at a rate of one revolution per second. At the end of this operation, allow the stirring rod to rest in the beaker. Permit a period of 10 min to elapse before repeating the stirring operation. The number of cycles (10-min rest period and 5-s stirring) to be performed will depend on the type of adhesive under test. For most adhesives, about 6 cycles will be required. Alternate stirring times and rest periods can be used, provided the conditions are agreed upon between the purchaser and the manufacturer. Record the time at which the last 5-s stirring operation is completed.

6.6 At the end of any number of stirring cycles agreed upon between the purchaser and the manufacturer, test the samples for consistency.

7. Report

7.1 Report the following information:

7.1.1 Complete identification of the adhesive, including type, source, manufacturer's code number, form, date of test, date of manufacture, and the mixing proportions followed in preparing the adhesive for use,

7.1.2 Complete identification of the viscometer and details of the test procedure, or the ASTM test method used,

7.1.3 Number of cycles (10-min rest period and 5-s stirring) performed, and total time elapsing from start to finish of this operation.

7.1.4 Consistency results on both the freshly received and worked adhesives, and

7.1.5 Pertinent observations, such as settling, discoloring, separating, caking, or gelling which might influence the usability of the adhesive.

BOND STRENGTH PROCEDURE

8. Apparatus

8.1 *Testing Machine*, of suitable capacity, capable of maintaining a specified rate of loading, and equipped with self-aligning grips for holding the test specimens.

8.2 *Controlled Atmosphere Chamber*—Provide a temperature of 23 ± 1.1°C (73.4 ± 2°F) and 50 ± 2 % relative humidity for these tests. Alternative controlled conditions are permissible, provided the conditions are agreeable to the purchaser and the manufacturer.

9. Procedure

9.1 Conduct the bond strength test on both the adhesive when freshly prepared and on the adhesive after having been subjected to the working-life test.

9.2 Prepare and blend the adhesive in accordance with 6.2, 6.3, 6.4, and 6.5.

9.3 At the end of any number of stirring cycles agreed upon between the purchaser and the manufacturer, employ the samples to prepare bond-strength specimens as described in Section 10.

10. Preparation of Test Specimens

10.1 Prepare test panels or sheets for determining the bond strength of the adhesive in accordance with any of the ASTM test methods suitable for the purpose. For example, use the lap-type shear specimens or the spool-type tensile specimens such as those described in Test Methods D 897, D 906, and D 1002.

10.2 In preparing the test specimens, use the adhesive in accordance with the instructions of the manufacturer. Prepare test specimens for bond strength for both the original adhesive as received and for the adhesive which has been subjected to the working-life test, using the same procedure and conditions of bonding.

11. Report

11.1 Report the following information:

11.1.1 Complete identification of the adhesive including type, source, manufacturer's code number, form, date of test, date of manufacture, and the mixing proportions followed in preparing the adhesive for use,

11.1.2 Complete identification of the adherends used, including the method of cleaning, the manner of applying the adhesive, the curing treatment, all other pertinent bonding conditions, and the ASTM test methods used,

11.1.3 Number of cycles (10-min rest period and 5-s stirring) performed, and total time elapsing from start to finish of this operation.

11.1.4 Bond strength test results on both the freshly received and worked adhesives, and

11.1.5 Pertinent observations, such as settling, discoloring, separating, caking, or gelling which might influence the usability of the adhesive.

12. Precision and Bias

12.1 Both the Consistency Procedure and the Bond Strength Procedure are dependent upon the precision and bias of the test method chosen.

13. Keywords

13.1 adhesive; bond strength; consistency; working life