
Standard Method of Test for Testing Epoxy Resin Adhesive

AASHTO Designation: T 237-22

Technically Revised: 2022

Technical Subcommittee: 4c, Markings and Coatings



**American Association of State Highway and Transportation Officials
555 12th Street NW, Suite 1000
Washington, D.C. 20004**

Standard Method of Test for

Testing Epoxy Resin Adhesive

AASHTO Designation: T 237-22

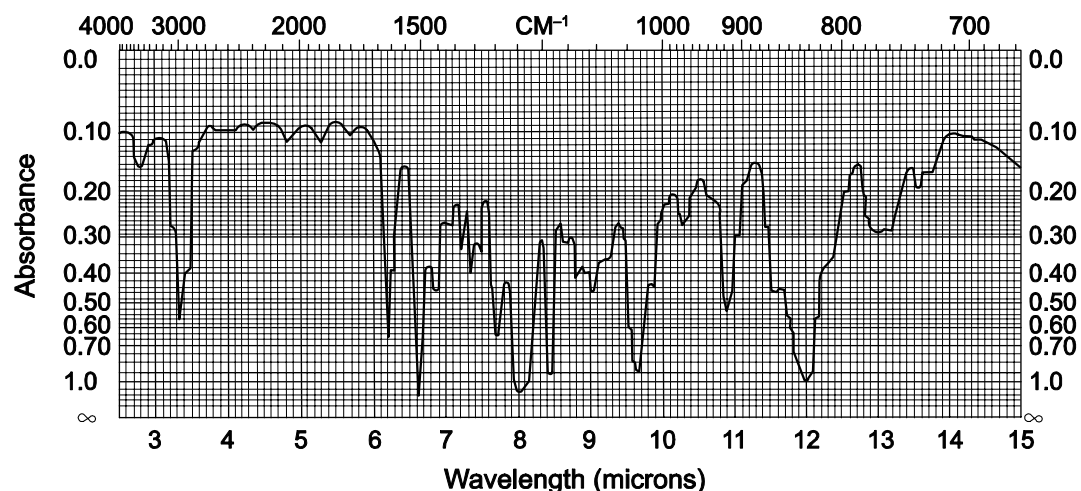
Technically Revised: 2022

Technical Subcommittee: 4c, Markings and Coatings

AASHTO

1. SCOPE

- 1.1. The methods given cover the examination of epoxy resin adhesives for use in bonding traffic markers to pavements, cured concrete to cured concrete, and fresh concrete to cured concrete, and are divided into two parts:
- 1.2. Part I (Sections 3 through 25) covers M 235M/M 235, Class I and II, and M 237, Class I adhesives. (See Figure 1.)
- 1.3. Part II (Sections 26 through 35) covers M 235M/M 235, Class III and M 237, Class II adhesives. (See Figure 1.)



Example of an IR Scan of One Component (Part) of a Multicomponent Epoxy Adhesive System

Figure 1—Example Spectrogram for Epoxy Adhesive Component

- 1.4. The values stated in SI units are to be regarded as the standard.
- 1.5. *The quality of the results produced by this standard are dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of R 18 are generally considered capable of*

competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with R 18 alone does not completely assure reliable results. Reliable results depend on many factors; following the suggestions of R 18 or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.

2. REFERENCED DOCUMENTS

2.1. AASHTO Standards:

- < M 6, Fine Aggregate for Hydraulic Cement Concrete
- < M 85, Portland Cement
- < M 235M/M 235, Epoxy Resin Adhesives
- < M 237, Epoxy Resin Adhesives for Bonding Traffic Markers to Hardened Portland Cement and Asphalt Concrete
- < M 339M/M 339, Thermometers Used in the Testing of Construction Materials
- < R 18, Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
- < T 106M/T 106, Compressive Strength of Hydraulic Cement Mortar (Using 50-mm or 2-in. Cube Specimens)
- < T 132, Tensile Strength of Hydraulic Cement Mortars

2.2. ASTM Standards:

- < C778, Standard Specification for Standard Sand
- < D570, Standard Test Method for Water Absorption of Plastics
- < D1002, Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal)
- < D1084, Standard Test Methods for Viscosity of Adhesives
- < E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
- < E230/E230M, Standard Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples
- < E879, Standard Specification for Thermistor Sensors for General Purpose and Laboratory Temperature Measurements
- < E1137/E1137M, Standard Specification for Industrial Platinum Resistance Thermometers
- < E2877, Standard Guide for Digital Contact Thermometers

2.3. International Electrotechnical Commission Standards:

- < IEC 60584-1: 2013 Thermocouples - Part 1: EMF Specifications and Tolerances
- < IEC 60751: 2008 Industrial Platinum Resistance Thermometers and Platinum Temperature Sensors

2.4. Other Standard:

- < Fed. Std. No. 141, Paint, Varnish, Lacquer, and Related Materials: Methods of Inspection, Sampling and Testing, Method 4184, Percent Air; Method 4242, Color of Transparent Liquids (Hellige Scale)

PART I

3. GEL TIME—APPARATUS AND MATERIALS

- 3.1. Gel timer.
- 3.2. Disposable wire stirrers.
- 3.3. Unwaxed paper cups, 60-mL (2-oz), 38-mm (1-1/2 in.) diameter base.
- 3.4. Unwaxed paper cups, 240-mL (8-oz), 76-mm (3-in.) diameter base.
- 3.5. Stainless Steel Spatula with blade 150 by 25 mm (6 by 1 in.), and with the end cut square.
- 3.6. Stopwatch.
Note 1—Equipment available from SHYODU Gel Timer Model 100, SHYODU Instrument Company, 6351 Old Tipton Road, Millington, TN 38053, Telephone (901) 872-6894, Facsimile (901) 872-6868.
- 3.7. Thermometer for measurement of various temperatures shall meet the requirements of M 339M/M 339 with a temperature range of at least -15 to 65°C (5 to 149°F) and an accuracy of $\pm 0.25^{\circ}\text{C}$ ($\pm 0.45^{\circ}\text{F}$) (see Note 2).
Note 2—Thermometer types suitable for use include ASTM E1 mercury thermometers; ASTM E879 thermistor thermometer with a $\pm 0.2^{\circ}\text{C}$ accuracy; ASTM E1137/E1137M Pt-100 RTD Class A thermometer; or IEC 60751: 2008 Pt-100 RTD Class AA thermometer.

4. GEL TIME—PROCEDURE

- 4.1. Condition both A and B components to $25 \pm 1^{\circ}\text{C}$ ($77 \pm 2^{\circ}\text{F}$).
- 4.2. Stir the separate components vigorously with a spatula to redisperse any settled material. Use separate spatulas for each component.
- 4.3. Using the 60-mL cups, prepare 100 g of epoxy adhesive by measuring each component in the proper ratio into a 240-mL paper cup.
- 4.4. Start stopwatch immediately and mix the components for 60 s using a spatula and taking care to scrape the sides and bottom of the cup periodically.
- 4.5. Place the sample at $25 \pm 1^{\circ}\text{C}$ ($77 \pm 2^{\circ}\text{F}$) in a retaining ring on the gel timer.
- 4.6. Insert wire stirrer into the sample and attach to the gel timer. Check to ensure the stirrer does not touch the side or bottom of the cup.
- 4.7. Zero the gel timer.
- 4.8. Start the gel timer.
- 4.9. Stop the stopwatch and record the initial mixing time.
- 4.10. Record the time from the gel timer when it stops.

- 4.11. The gel time is the initial time of mixing plus the elapsed time recorded by the gel timer.

5. POT LIFE (OPTIONAL PROCEDURE)—APPARATUS AND MATERIALS

- 5.1. Unwaxed paper cups, 240-mL (8-oz), 50 ± 6 -mm ($2 \pm 1/4$ -in.) diameter base.
- 5.2. Unwaxed paper cups, 60-mL (2-oz), 38-mm ($1 1/2$ -in.) diameter base.
- 5.3. Wooden tongue depressor with ends cut square.
- 5.4. Stainless steel spatula with blade 150 by 25 mm (6 by 1 in.), and with the end cut square.
- 5.5. Thermometers for measurement of various temperatures shall meet the requirements of M 339M/M 339 with a temperature range of at least -15 to 65°C (5 to 149°F) and an accuracy of $\pm 0.25^{\circ}\text{C}$ ($\pm 0.45^{\circ}\text{F}$) (see Note 3).

Note 3—Thermometer types suitable for use include ASTM E1 mercury thermometers; ASTM E879 thermistor thermometer with a $\pm 0.2^{\circ}\text{C}$ accuracy; ASTM E1137/E1137M Pt-100 RTD Class A thermometer; or IEC 60751: 2008 Pt-100 RTD Class AA thermometer.

6. POT LIFE (OPTIONAL PROCEDURE)—PROCEDURE

- 6.1. Condition both A and B components to $25 \pm 1^{\circ}\text{C}$ ($77 \pm 2^{\circ}\text{F}$).
- 6.2. Stir the separate components vigorously with a spatula to redisperse any settled materials. Use separate spatula for each component.
- 6.3. Using the 60-mL cups, measure each component, in the proper ratio, into the 240-mL cup.
- 6.4. Start stopwatch immediately and mix the components for 60 s using a wooden tongue depressor and taking care to scrape the sides and bottom of the cup periodically.
- 6.5. Place the sample at $25 \pm 1^{\circ}\text{C}$ ($77 \pm 2^{\circ}\text{F}$) on a wooden bench top that is free of excessive drafts.
- 6.6. Probe the mixture once with the tongue depressor every 30 s, starting 5 min prior to the minimum specified pot life.
- 6.7. The time at which a soft stringy mass forms in the center of the cup is the pot life.

INFRARED SPECTRUM

7. APPARATUS

- 7.1. Double-beam infrared recording spectrophotometer,¹ 2.5 microns to 15 microns.
- 7.2. Disk holder for a disk approximately 25 mm in diameter.
- 7.3. Two sodium chloride crystal disks approximately 25 mm in diameter.