
Standard Method of Test for

Thermoplastic Traffic Line Material

AASHTO Designation: T 250-22

Technically Revised: 2022

Technical Subcommittee: 4c, Markings and Coatings



**American Association of State Highway and Transportation Officials
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1. SCOPE

1.1. The procedures used for testing thermoplastic traffic line material are described in this method. This includes the method for obtaining a representative test sample, preparation of the test specimens, and performing the specified tests. The material is a mixture of resins, fillers, pigments, and reflective spheres. These materials are combined by heating to obtain a product with the desired properties suitable for traffic line striping.

1.2. *This test method is divided into the following parts:*

1.2.1. Section 3, Sampling of Thermoplastic Material;

1.2.2. Section 4, Sample Meltdown and Preparation;

1.2.3. Section 5, Binder Content;

1.2.4. Section 6, Glass Bead Content;

1.2.5. Section 7, Glass Bead Grading Analysis;

1.2.6. Section 8, Reflectance, Color, and Yellowness Index;

1.2.7. Section 9, Titanium Dioxide Determination;

1.2.8. Section 10, Lead Chromate Determination;

1.2.9. Section 11, Flowability (Percent Residue);

1.2.10. Section 12, Low Temperature Stress Resistance;

1.2.11. Section 13, Bond Strength;

1.2.12. Section 14, Impact Resistance;

1.2.13. Section 15, Ring-and-Ball Softening Point;

1.2.14. Section 16, Specific Gravity;

1.2.15. Section 17, Flowability (Percent Residue) Extended Heating;

1.2.16. Section 18, Ultraviolet Light and Condensate Exposure;

- 1.2.17. Section 19, Hardness; and
- 1.2.18. Section 20, Flash Point.
- 1.3. The values stated in SI units are to be regarded as the standard.
- 1.4. *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.*
- Note 1—Warning:** Due to the elevated temperatures used in these tests and the nature of the material, extreme care should be used when working with the thermoplastic materials. Use heat-resistant gloves and safety glasses or face shield when handling in the fluid state. Severe burns can result from spilled thermoplastics or mishandled equipment. Should melted thermoplastic come in contact with the skin, do not attempt to wipe off. Immediately hold or submerge the affected area under cold water. Inform someone in the immediate vicinity that an accident has occurred. Seek proper medical attention.

2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards:*
- < M 231, Weighing Devices Used in the Testing of Materials
 - < M 247, Glass Beads Used in Pavement Markings
 - < M 249, White and Yellow Reflective Thermoplastic Striping Material (Solid Form)
 - < 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
- 2.2. *ASTM Standards:*
- < D36/D36M, Standard Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)
 - < D92, Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
 - < D256, Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
 - < D792, Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
 - < D2240, Standard Test Method for Rubber Property—Durometer Hardness
 - < D4764, Standard Test Method for Determination by X-ray Fluorescence Spectroscopy of Titanium Dioxide Content in Paint
 - < D4796, Standard Test Method for Bond Strength of Thermoplastic Traffic Marking Materials
 - < D4797, Standard Test Methods for Gravimetric Analysis of White and Yellow Thermoplastic Pavement Marking
 - < D4960, Standard Test Method for Evaluation of Color for Thermoplastic Traffic Marking Materials
 - < E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
 - < E11, Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
 - < E230/E230M, Standard Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples

- < E313, Standard Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates
- < E879, Standard Specification for Thermistor Sensors for General Purpose and Laboratory Temperature Measurements
- < E1137/E1137M, Standard Specification for Industrial Platinum Resistance Thermometers
- < E1349, Standard Test Method for Reflectance Factor and Color by Spectrophotometry Using Bidirectional (45°:0° or 0°:45°) Geometry
- < E2877, Standard Guide for Digital Contact Thermometers
- < G154, Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

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. *Federal Standard:*

- < Federal Standard No. 141, Paint, Varnish, Lacquer and Related Materials

3. **SAMPLING OF THERMOPLASTIC MATERIAL**

3.1. It is important to obtain a truly representative sample of the thermoplastic material for testing. This can be difficult due to the wide ranges of sizes, shapes, and densities of the particular raw materials that are used in the material formulation. The following three methods provide a way to obtain representative samples from a production lot of thermoplastic pavement marking material for testing.

3.2. *Quartering Method:*

3.2.1. *Apparatus and Materials:*

3.2.1.1. 1.2-by-1.2-m (4-by-4-ft) section of cardboard, smooth wood, or metal;

3.2.1.2. Metal scooping pan;

3.2.1.3. Metal splitting device;

3.2.1.4. Three 22-kg (50-lb) bags of thermoplastic (randomly selected); and

3.2.1.5. Unlined 3.8-L (1-gal) cans.

3.2.2. *Procedure:*

3.2.2.1. Randomly select three 22-kg (50-lb) bags from the lot to be sampled [up to 22 000 kg (50,000 lb)].

3.2.2.2. Place the selection of cardboard, wood, or metal on a level section of floor.

3.2.2.3. Empty the contents of one of the 22-kg (50-lb) bags onto the sample area. Using the metal scoop, mix the material, breaking up any large lumps. Shape the pile of thermoplastic into as high a pile as possible, forming a symmetrical inverted cone.

- 3.2.2.4. Take the metal splitting device and center it over the apex of the thermoplastic. Lower the device onto the material, thus splitting it into four quarter sections.
- 3.2.2.5. Take the material from any two opposing quarters and return it to the thermoplastic bag. The two remaining quarters are to be mixed and split in the same manner as explained above, rotating between the two quarters that are retained at the end of each step. Repeat the process for a total of four times. Retain the final two opposing quarters as a part of the composite sample and place in the unlined 3.8-L (1-gal) can.
- 3.2.2.6. Perform the same procedure as outlined using the two remaining bags. When the final quarters are taken from the two bags, the sum of the three bags should fill the 3.8-L (1-gal) sample container and should weigh between 4 and 4.5 kg (9 and 10 lb).
- 3.2.2.7. Label the outside of the 3.8-L (1-gal) sample can with adequate identification markings including: manufacturer, product number, batch number, date of manufacture, color, and specification.
- 3.2.2.8. The entire composite sample should be melted for the preparation of test samples as called for in Section 4, Sample Meltdown and Preparation.
- 3.3. *Splitter Method:*
- 3.3.1. *Apparatus and Material:*
- 3.3.1.1. 1:1 Splitter with pans;
- 3.3.1.2. Three 22-kg (50-lb) bags of thermoplastic (randomly selected); and
- 3.3.1.3. Unlined 3.8-L (1-gal) can.
- 3.3.2. *Procedure:*
- 3.3.2.1. Randomly select three 22-kg (50-lb) bags of thermoplastic from the lot to be tested (up to 22 000 kg (50,000 lb)).
- 3.3.2.2. Empty the contents of one of the bags into one of the pans and place on top of the 1:1 splitter.
- 3.3.2.3. Place a pan underneath each of the two discharge sections of the splitter.
- 3.3.2.4. Empty the contents in the top pan such that the material passes through the splitter.
- 3.3.2.5. Take each half and split individually to form quarters. Return two opposing pans, or quarters, to the bag. Split the two remaining pans individually to form quarters. Repeat the above procedure by splitting the two opposing pans while returning the others to the bag. This splitting procedure is performed four times before placing the final quarters into the sample container.
- 3.3.2.6. Perform the same procedure on the two remaining bags of thermoplastic. When the final quarters are taken from the two bags, the sum of the three bags should fill the 3.8-L (1-gal) sample container and should weigh between 4 and 4.5 kg (9 and 10 lb).
- 3.3.2.7. Label the outside of the 3.8-L (1-gal) sample can with adequate identification markings including: manufacturer, product number, batch number, date of manufacture, color, and specification.
- 3.3.2.8. The entire composite sample should be melted for the preparation of test samples as called for in Section 4, Sample Meltdown and Preparation.