



Standard Test Method for Evaluation of Color for Thermoplastic Traffic Marking Materials¹

This standard is issued under the fixed designation D 4960; 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 test method covers the instrumental determination of color of thermoplastic traffic marking materials in the CIE 1931 system.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information 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 883 Terminology Relating to Plastics²

E 97 Test Method for Directional Reflectance Factor, 45-deg, 0-deg, of Opaque Specimens by Broad-Band Filter Reflectometry³

E 179 Guide for Selection of Geometric Conditions for Measurement of Reflectance and Transmission Properties of Materials⁴

E 284 Terminology of Appearance⁴

E 308 Practice for Computing the Colors of Objects by Using the CIE System⁴

E 1164 Practice for Obtaining Spectrophotometric Data for Object-Color Evaluation⁴

F 412 Terminology Relating to Plastic Piping Systems⁵

3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminology D 883, E 284 and F 412, unless otherwise indicated.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *thermochromism*—a color hue change that takes place in the thermoplastic material due to temperature changes.

3.2.2 *thermoplastic traffic marking material*—a highly filled

100 % total solids highway marking material that when heated to a molten state can be extruded or sprayed onto a road surface and when cooled forms a solid, durable delineator.

4. Summary of Test Method

4.1 The thermoplastic specimen is prepared for this test by melting a sample to its application temperature under continuous agitation and then pouring it into a TFE-fluorocarbon coated pan, to form a patty of approximately 3 in. (7.6 cm) in diameter. The patty is allowed to cool to room temperature before measuring the color. Color measurements are made on the flat side or the top side of the thermoplastic patty.

NOTE 1—No significant color differences are encountered in reading the top or bottom of the patty.

5. Significance and Use

5.1 This test method provides a standard procedure for the determination of color of thermoplastic traffic marking materials. This test method can be used in conjunction with specifications to determine the uniformity of thermoplastic traffic marking materials from batch to batch and that produced by various suppliers.

5.2 There is a slight variation in color standards and colorimeters. This test method is only applicable when results are reported with the instrument model designation and white color calibration standard identification information.

6. Apparatus

6.1 *Agitator Blade*, 6 in. (15 cm) long with a 1/2-in. (1-cm) steel shaft and a 1 3/4 by 1 by 1/8-in. (4.5 by 2.5 by 0.3-cm) straight horizontal steel blade.

6.2 *Drill Press*, or other apparatus capable of agitating the thermoplastic marking material in the electric pots at 600 to 700 r/min during meltdown to the application temperature.

6.3 Heating Equipment:

6.3.1 *Gravity Convection Oven*, capable of maintaining 260°C, for melting the thermoplastic traffic marking.

6.3.2 *Hot Plate*, capable of maintaining 537°C.

6.3.3 *Insulated Electric Pots*, for heating and melting the thermoplastic traffic marking materials.

6.4 *Color Measuring Instrument*, conforming to all requirements of Test Method E 97, Practices E 179 and E 1164, and Practice E 308 (geometry 45°/0°, illuminant C, 2° observer).

¹ This test method is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.44 on Traffic Coatings.

Current edition approved June 30, 1989. Published August 1989.

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

³ Discontinued, see 1991 *Annual Book of ASTM Standards*, Vol 06.01.

⁴ *Annual Book of ASTM Standards*, Vol 06.01.

⁵ *Annual Book of ASTM Standards*, Vol 08.04.

6.5 *Spatulas*, for stirring the thermoplastic traffic marking during meltdown on the hot plate or in the gravity convection oven.

6.6 *TFE-fluorocarbon Baking Pans or Uncoated Pint Can Lids*, for forming 3-in. (7.6-cm) diameter patties.

7. Sampling

7.1 Samples may be obtained by an appropriate quartering or riffle sampling method where deemed necessary considering the physical form of the material.

8. Procedure

8.1 Taking care to prevent scorching of the material, melt a 35 ± 1.75 oz (1000 ± 50 -g) sample of the thermoplastic marking material to a temperature of 218°C under continuous agitation, by one of the following means:

8.1.1 On a hot plate set at 537°C and using a spatula as the means of agitation.

8.1.2 In an insulated electric pot with a heat setting sufficient to reach the test temperature and with agitation of 600 to 700 r/min from an electric drill press or other suitable means.

8.1.3 In an oven set at 260°C with agitation by stirring with a spatula after the first 15 min and thereafter at 15-min intervals. The first stirring at 15 min is critical to prevent scorching of the thermoplastic marking material. The sample must be completely wet in on the first stir to ensure even melting and complete blending of the components of the thermoplastic material.

8.2 Pour the thermoplastic sample into a clean, TFE-fluorocarbon-lined pan, to form a 3-in. (7.6-cm) diameter patty. If a TFE-fluorocarbon pan is not available, pour the sample into an uncoated pint tin lid to form a 3-in. diameter patty. Before pouring the patty, the sample must be agitated well to prevent settling of the components and to provide a smooth homogeneous surface for color measurement.

8.3 Allow the patty to cool to room temperature for a minimum of 30 min and not to exceed 45 min.

NOTE 2—A 30 ± 5 -min conditioning of the patty negates the initial effects of thermochromism.

8.4 Calibrate the color measuring instrument with a white calibration color standard according to the instructions supplied by the manufacturer.

8.5 Remove the patty from the TFE-fluorocarbon pan and read the color measurement values from the flat smooth side. If a pint tin lid is used then read the top of the patty. Without removing the patty from the sample port immediately take three readings. Record only the third reading for each Y , x , and y value to further compensate for any thermochromism of the thermoplastic marking material.

8.6 A small port adapter, if available, for the color measuring instrument of approximately $\frac{3}{4}$ in. (19 mm) may be used to negate the effects of geometry and texture when reading the patties. This will measure in between small surface imperfections characteristic of thermoplastic traffic marking.

9. Report

9.1 Report the following information:

9.1.1 The formula code, batch number, formula type, and color for each patty read,

9.1.2 The type of color measuring instrument used and the identification of the white color calibration standard, and

9.1.3 The exact cooling period and values Y , x and y for each sample.

10. Precision and Bias

10.1 No general statement of precision can be made because of lack of sufficient data at this time.

10.2 No statement of bias can be prepared for this test method since there is no absolute test method for use as a comparative basis.

11. Keywords

11.1 thermoplastic traffic marking; color measurement.

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