



Standard Specification for Color of Pavement Marking Materials¹

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1. Scope

1.1 This specification covers the daytime and nighttime color of retroreflective pavement marking materials used for traffic control lane markings and symbols on road surfaces. It is intended to apply throughout the service life of the material.

1.2 This specification applies to both painted and tape lines, including thermoplastic, epoxy and other types.

1.3 This specification is not applicable to the testing, for quality control purposes, of marking material without added drop-on beads.

1.4 In addition, it does not describe requirements other than color such as retroreflectance.

2. Referenced Documents

2.1 ASTM Standards:

D 4061 Test Method for Retroreflectance of Horizontal Coatings²

D 6359 Specification for Minimum Retroreflectance of Newly Applied Pavement Marking Using Portable-Hand-Operated Instruments³

E 284 Terminology of Appearance²

E 308 Practice for Computing the Colors of Objects by Using the CIE System²

E 808 Practice for Describing Retroreflection²

E 811 Practice for Measuring Colorimetric Characteristics of Retroreflectors Under Nighttime Conditions²

E 1349 Test Method for Reflectance Factor and Color by Spectrophotometry Using Bidirectional Geometry²

2.2 CIE Publications:

No. 15.2 Colorimetry⁴

No. 39.2 Recommendations for Surface Colours for Visual Signalling⁴

3. Terminology

3.1 Definitions:

¹ This specification is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.38 on Highway Traffic Control Materials.

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² *Annual Book of ASTM Standards*, Vol 06.01.

³ *Annual Book of ASTM Standards*, Vol 04.03.

⁴ Available from USNC-CIE Publications Office, TLA Lighting Consultants, Inc., 7 Pond Street, Salem, MA 01970.

3.1.1 Definitions of appearance terms in Terminology E 284 are applicable to this specification.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *pavement marking structured materials*— a structured road marking has faces or edges in a regular or random pattern that are tilted towards the direction of traffic in order to enhance retroreflection in wet or rainy conditions or to produce acoustic or vibrational effects by the passage of wheels, or both. The pattern can be produced by non-uniform application of material in the liquid state, by reworking the surface of applied material while still liquid, or by other suitable means.

4. Significance and Use

4.1 This specification is intended for use during the lifetime of the retroreflective pavement marking on the road surface. Specifications for characteristics other than color are found in other ASTM documents.

5. Performance Requirements

5.1 *Chromaticity Limits*—The material must plot within the boundaries described by the four corner points listed in Tables 1 and 2 when measured in accordance with the test methods in Section 7.

5.1.1 *Table 1*—Daytime (x,y) chromaticity coordinates of the corners of the regions for the colors of white, yellow, blue and red pavement markings.

5.1.2 *Table 2*—Nighttime (x,y) chromaticity coordinates of the corners of the regions for the colors of white and yellow pavement markings.

5.1.3 *Chromaticity and Retroreflectance*— The third dimension of the perceived appearance of the road marking at night is the retroreflectance. This quantity is specified in other ASTM documents on pavement markings and is not part of pavement marking nighttime color specification. Research has shown that the nighttime color as specified by chromaticity is sufficient and adequate for the color naming of the material as viewed under nighttime conditions.

5.2 *Daytime Lightness Limits (Y Tristimulus Coordinate)*—The lightness limits shall conform to Table 3. (The 45/0 and 0/45 geometry is the current standard practice for these measurements.

NOTE 1—Daytime luminance factor testing of pavement markings excludes structured materials. They should be tested at the viewing angle

TABLE 1 Daytime Color

NOTE 1—Daytime, Geometry – 45/0 (0/45), CIE illuminant D65 and the CIE 1931 (2°) standard observer.

Color	Daytime Chromaticity Coordinates (Corner Points)							
	1		2		3		4	
	x	y	x	y	x	y	x	y
White	0.355	0.355	0.305	0.305	0.285	0.325	0.335	0.375
Yellow	0.560	0.440	0.490	0.510	0.420	0.440	0.460	0.400
Red	0.480	0.300	0.690	0.315	0.620	0.380	0.480	0.360
Blue	0.105	0.100	0.220	0.180	0.200	0.260	0.060	0.220

TABLE 2 Nighttime Color

NOTE 1—Nighttime, Geometry – observation angle of 1.05° and entrance angle of 88.76°. CIE illuminant A and the CIE 1931 (2°) standard observer.

Color	Nighttime Chromaticity Coordinates (Corner Points)							
	1		2		3		4	
	x	y	x	y	x	y	x	y
White	0.480	0.410	0.430	0.380	0.405	0.405	0.455	0.435
Yellow	0.575	0.425	0.508	0.415	0.473	0.453	0.510	0.490

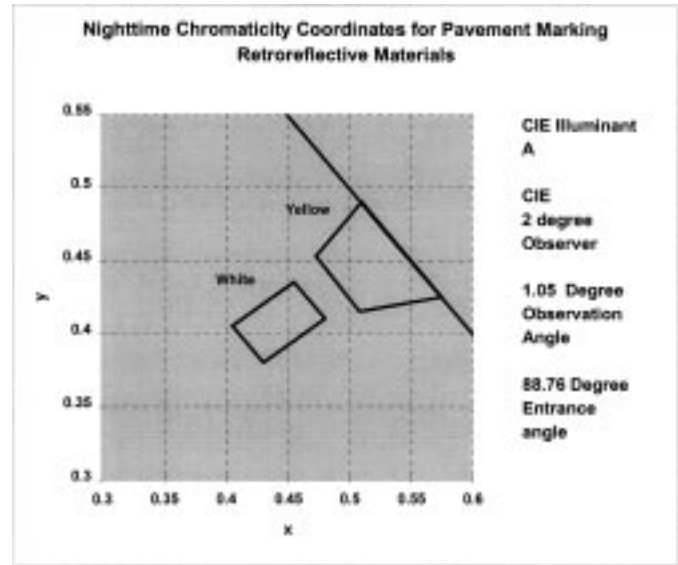


FIG. 2 Nighttime Chromaticity of Pavement Markings

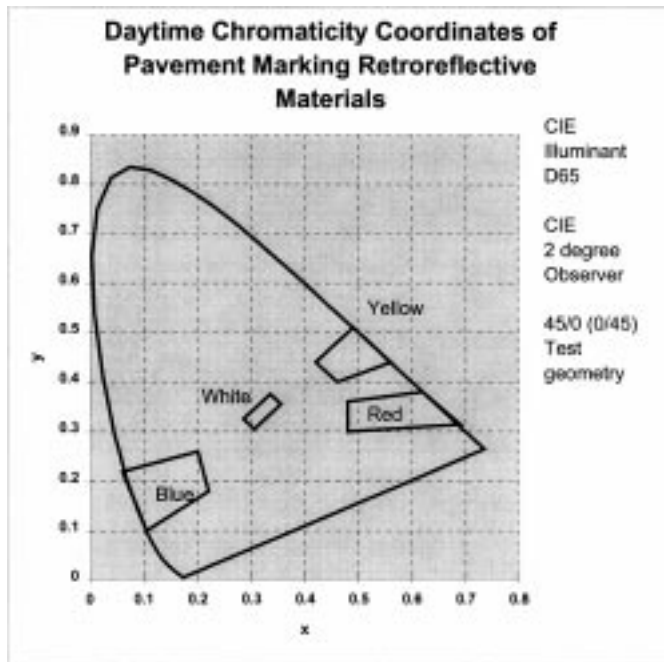


FIG. 1 Daytime Chromaticity of Pavement Markings

encountered in usage using diffuse illumination and 87.71° viewing angle, which is not covered in this standard.

6. Specimen Preparation

6.1 The test specimen shall be measured mounted on a flat test panel with a minimum test area of 0.1 m² in size. Typical test panels are 100 by 1000 mm.

TABLE 3 Luminance Factor, Cap Y^A

Color	With Glass Beads	
	Y	Y
	Minimum	Maximum
White	35	...
Yellow	25	...
Red	6	15
Blue	5	14

^A The following in-service daytime luminance factor limits (tristimulus value Y expressed as a percent) apply when measured with 45/0 (0/45) geometry and illuminant D65 using the 1931 CIE 2° standard observer.

7. Test Methods

7.1 *Sample Conditioning*—For new material conditioning, see Specification D 6359. For in-service testing, sample should be free of dirt or other obvious contamination.

7.2 *Daytime Color*—Daytime color shall be measured in accordance with Test Method E 1349, using 45/0 (0/45) geometry, CIE illuminant D65 and the 1931 CIE 2° standard observer. (See Annex A1 for correction factors when using illuminant C).

7.3 *Nighttime Color*—The measurement of nighttime chromaticity shall be in accordance with Test Method E 811 using the geometric tolerance and sample positioning (including angle setting techniques) as described in Test Method D 4061.

NOTE 2—The referenced nighttime color test method is primarily a laboratory procedure, and may not be convenient for use in the field for the measurement of material in service. More convenient field test instruments complying with this test method are expected to be available in the near future.

8. Keywords

8.1 pavement marking; retroreflective materials

ANNEX
(Mandatory Information)
A1. CHANGE OF ILLUMINANT FACTORS

A1.1 The correction factors given in Table A1.1 change measurements made using illuminant C to approximate measurements made using illuminant D65.

TABLE A1.1 Correction Factors

NOTE 1—For Example—A blue sample which measured (x, y, Y) = (0.0150, 0.150, 5.0) using illuminant C would be converted to (0.149, 0.158, 5.0) to provide the result using illuminant D65.

Color	x	y	Y
White	+0.003	+0.014	0.00
Yellow	+0.001	+0.002	0.00
Red	0.000	+0.001	0.00
Blue	-0.001	+0.008	0.00

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