



Designation: D 4592 – 01

Standard Specification for Preformed Retroreflective Pavement Marking Tape for Limited Service Life¹

This standard is issued under the fixed designation D 4592; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This specification covers white or yellow preformed retroreflective pavement marking tapes that are designed to provide a service life of typically 3 to 6 months, and occasions of up to one year on roads with up to 15 000 average daily traffic count (ADT).

1.2 The tapes are intended for use as longitudinal, transverse or word/symbol pavement markings that provide delineation day and night. The tapes may be either removable or nonremovable.

1.3 The values stated in SI units are to be regarded as the standard.

2. Referenced Documents

2.1 ASTM Standards:

D 1000 Test Methods for Pressure-Sensitive Adhesive Coated Tapes Used for Electrical and Electronic Insulation²

D 1898 Practice for Sampling Plastics³

D 4061 Test Method for Retroreflectance of Horizontal Coatings⁴

E 303 Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester⁵

E 811 Practice for Measuring Colorimetric Characteristics of Retroreflectors under Nighttime Conditions⁴

E 1349 Test Method for Reflectance Factor and Color by Spectrophotometry using Bidirectional Geometry⁴

E 1710 Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer⁴

2.2 Federal Standard:⁶

Fed Std Test Method 141

2.3 CIE Publications:⁷

No. 15.2 Colorimetry

No. 39.2 Recommendations for Surface Colours for Visual Signaling

3. Terminology

3.1 Definitions:

3.1.1 *limited service life or period*—a minimum service period of three months when placed in accordance with the manufacturer's recommended procedures on pavement surfaces having no more than 15 000 average daily traffic/lane.

NOTE 1—15 000 ADT per lane is typical of heavily traveled roads such as interstate highways through major urban areas.

3.1.2 *preformed tape*—continuous, flexible pavement marking material that is essentially complete and that may be affixed to or imbedded in the road surface without fundamentally altering its configuration.

3.1.3 *retroreflection*—reflection in which radiation is returned in directions close to the direction from which it came, this property being maintained over wide variations of the direction of the incident radiation.

3.1.4 *retroreflector*—surface or device that reflects and returns a relatively high proportion of light in a direction close to the light source. This characteristic is maintained over a wide variation of the angle made by the incident light ray and the normal to the retroreflective surface.

3.1.5 *surface pattern*—a pattern on the surface, in which the raised areas are a minimum of 0.8 mm (31 mils) high and occupy approximately 50 % of the surface area, presenting a substantial area of nearly vertical face to traffic from any approach.

4. Classification

4.1 Pavement marking tape manufactured according to this specification shall be identified as Type I or Type II:

4.1.1 *Type I (Removable)*—Marking tapes, after serving the intended limited service life, shall be removable from asphalt or portland cement concrete surfaces at pavement temperatures above 4°C (40°F) intact or in pieces no less than about 600 cm² in area, either manually or with a mechanical device without the use of heat, solvents, grinding, or blasting that would

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.

Current edition approved Aug. 10, 2001. Published October 2001. Originally published as D 4592 – 86. Last previous edition D 4592 – 96.

² *Annual Book of ASTM Standards*, Vol 10.01.

³ *Annual Book of ASTM Standards*, Vol 08.01.

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

⁵ *Annual Book of ASTM Standards*, Vol 04.03.

⁶ Available from Naval Publications and Forms Center, 5801 Tabor Ave, Philadelphia, PA 19120.

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

damage or discolor the pavement so as to leave an impressed traffic lane mark.

4.1.2 *Type II (Non-Removable)*—This type of tape shall not be required to have removal characteristics as in 4.1.1.

NOTE 2—Type II tapes are most often used for short term applications in which markings are paved over during successive road construction operations.

5. Ordering Information

5.1 The purchaser using this specification shall include the following information:

- 5.1.1 ASTM designation (D 4592).
- 5.1.2 Classification Type (I or II; see 4.1).
- 5.1.3 Daytime color (See 6.3).
- 5.1.4 Width and length of rolls.
- 5.1.5 Any additional information.

6. Requirements

6.1 *Physical Requirements:*

6.1.1 The marking tape shall be a reflective film coated with a pressure-sensitive adhesive with or without a protective liner.

6.1.2 The marking tape shall be flexible and shall conform to the typical road pavement surface.

6.1.3 The marking tape shall adhere to asphalt or portland cement concrete roadway surfaces when applied according to the manufacturer’s recommended procedures on pavement surfaces having temperatures down to 10°C (50°F) at the time of application.

6.1.4 Immediately following application, the tape shall not require a cure or set time prior to opening to traffic.

6.1.5 The tape as supplied shall be free of cracks, and have true, straight, and unbroken edges. The actual width of rolls of preformed marking tape used for striping shall be no less than the nominal (stated) width and no more than 3 mm (1/8 in.) greater than the nominal width. The length shall be no less than the stated length.

6.2 *Retroreflectance:*

6.2.1 The marking tape shall be retroreflective, reflecting white or yellow, respectively, and shall be readily visible when viewed with automobile headlights at night and shall have minimum reflective values as shown in Table 1 when measured in accordance with the photometric testing procedures of Test Method D 4061 or E 1710. Reflective values shall be expressed as coefficient of retroreflected luminance (R_L) in millicandelas per square metre per lux.

6.3 *Color:*

6.3.1 The material must plot within the boundaries described by the corner points listed in Table 2 for daytime color and in Table 3 for nighttime color when measured in accordance with the test methods in section 6.3.6 for daytime color and section 6.3.7 for nighttime color.

6.3.2 *Chromaticity and Retroreflectance*—The third dimen-

sion of the perceived appearance of the road marking at night is the retroreflectance. This quantity is specified in Table 1. Research has shown that the nighttime color as specified by chromaticity is necessary and adequate for the color recognition of the material as viewed under nighttime conditions.

6.3.3 *Daytime Luminance Factor Limits (Y Tristimulus Coordinate)*—The luminance factor limits shall conform to Table 4. (The 45/0 and 0/45 geometry is the current standard practice for these measurements.)

6.3.4 *Specimen Preparation*—The test specimen shall be measured mounted on a flat test panel with a minimum test area of 0.1 square meters in size. Typical test panels are 100 by 1000 mm.

6.3.5 *Sample Conditioning:*

6.3.5.1 New material—see D 6359.

6.3.5.2 In-service sample should be free of dirt or other obvious contamination.

6.3.6 *Daytime Color Test Method*—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-degree standard observer.

6.3.7 *Nighttime Color Test Method*—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 D 4061.

6.4 *Adhesion:*

6.4.1 A sample of tape, 25.4 mm in width, applied according to the manufacturer’s recommended procedure and tested in accordance with Test Methods D 1000, shall have minimum adhesion values as shown in Table 5.

6.5 *Skid Resistance:*

6.5.1 The Type I marking tape shall have an average minimum frictional resistance value of 45 BPN (British Pendulum Number) when tested according to Test Method E 303.

NOTE 3—Skid resistance is not required for Type II non-removable tapes that are typically applied for a short duration and then paved over.

NOTE 4—Skid resistance levels of 45 BPN correspond to tapes having exposed retroreflective glass beads. Higher levels of skid resistance are achievable with the addition of skid-resistant elements.

NOTE 5—For tapes with a surface pattern, results are often quite variable. These tapes may be tested in a direction parallel to the flow of traffic and 45° from the direction of traffic, and the results averaged.

7. Durability and Wear Resistance

7.1 The marking tape, when applied in accordance with the manufacturer’s recommended procedures, shall show no appreciable fading, lifting, or shrinkage during the normal service life of the applied material. Samples of the tape applied to standard specimen plates and tested in accordance with Federal Test Method 141, Method 6192 using a CS-17 wheel, and 1000 g load, shall show no wear through to the backing after 2000 cycles for Type I and 1000 cycles for Type II.

8. Storage

8.1 *Storage Characteristics*—The marking tape as supplied shall have a minimum shelf life of one year from the date of purchase when stored at temperatures between 10 and 38°C (50° and 100°F).

TABLE 1 Reflective Values for Dry Samples (mcd m⁻²) Ix-1 (mcd ft⁻²(fc)⁻¹)

Entrance Angle	Observation Angle	Reflective Value, (RL)	
		White	Yellow
88.76°	1.05°	500	300

TABLE 2 Daytime Color

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

Daytime (x, y) chromaticity coordinates of the corners of the regions for the colors of white and yellow pavement marking tapes. [Daytime. Geometry—45/0 (0/45) and illuminant D65 and the CIE 1931 (2-degree) standard observer.]

TABLE 3 Nighttime Color

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

Nighttime (x, y) chromaticity coordinates of the corners of the regions for the colors of white and yellow pavement marking tapes. [CIE Illuminant A. Geometry—observation angle of 1.05 degree and entrance angle of 88.76 degrees. CIE 1931 (2-degree) standard observer]

TABLE 4 Luminance Factor, Y (%)

Color	Y	Y
	Minimum	Maximum
White	45	
Yellow	30	

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-degree standard observer.

TABLE 5 Adhesion

Application Temperature °C (°F)	Test Temperature °C (°F)	Minimum Adhesion, N
10 (50)	10 (50)	4.88
24 (75)	24 (75)	4.88
46 (115)	46 (115)	4.88

9. Packaging and Marking

9.1 The marking tape shall be packaged in rolls and there shall be no more than 3 splices/50m (164 ft) of length.

9.2 The tape shall be packaged in accordance with accepted commercial standards.

10. Keywords

10.1 pavement marking; pavement marking tape; retroreflectance; tape

ANNEX

(Mandatory Information)

A1. DISCUSSION OF “30-METRE” GEOMETRY

A1.1 The European Committee for Standardization (CEN) originally developed the geometry used in this standard for measuring the retroreflectance of preformed tape (entrance angle 88.76° and observation angle 1.05°). The angles were derived using theoretically typical heights for headlamps and drivers’ eyes. These heights were further simplified by assum-

ing a single headlamp is mounted directly under the driver’s eye (see Fig. A1.1). The geometry is considered a good approximation for drivers viewing preformed tape on a flat road, 30 m ahead of a car. Practical measures of retroreflectance at distances beyond 30 m have not yet been developed.

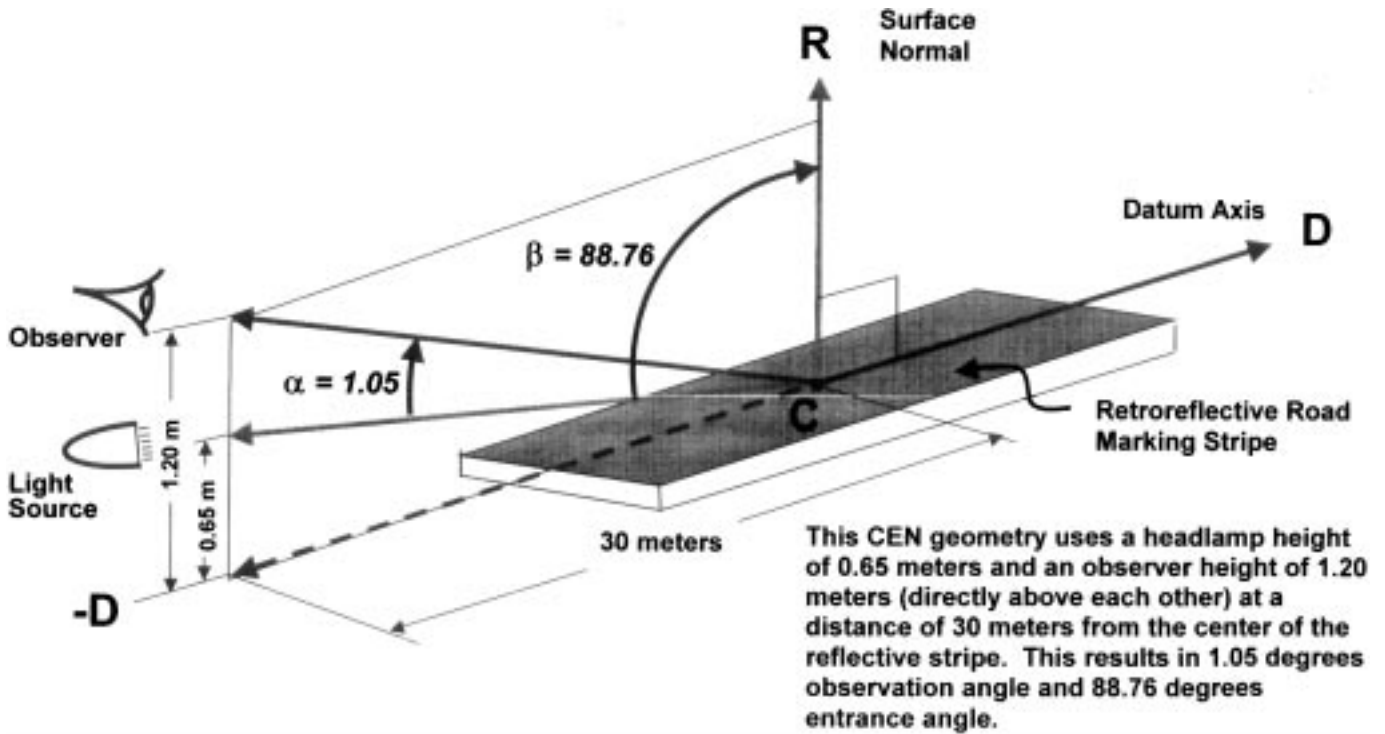


FIG. A1.1 CEN 30 Meter Geometry—Observation and Entrance Angles for Simplified CEN Car

The ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).