

Commonwealth of Pennsylvania  
Department of Transportation

**SPECIFICATION FOR BARRIER DELINEATION SHEETING**

November 2, 2000

**1. DESCRIPTION**

This specification covers structured wide-angle retroreflective sheeting designed for installation as a continuous line on Portland cement concrete barriers to provide daytime and nighttime visibility for typical roadway barrier configurations. Sheeting to be pre-printed in an alternating orange-and-white, yellow-and-black, or red-and-white block pattern.

**2. REQUIREMENTS**

**2.1 Pattern and Dimensions.** Orange-and-white and the red-and-white materials shall be printed with alternating rectangular sections that are 425 mm (17”) in length. The yellow-and-black material shall be printed with alternating rectangular sections with the yellow being 650 mm (26”) in length and the black being 200 mm (8”) in length. All materials to be at least 200 mm (8”) wide.

**2.2 Color.** Through instrumental color testing, the diffuse daytime color of the reflective sheeting to conform to color requirements as determined in accordance with ASTM E 1164 and E 1349, using either 45/0 or 0/45° illumination/viewing conditions as described therein. Calculate chromaticity and the luminance factor in accordance with ASTM E 308 based on CIE tristimulus values for the 2° observer and illuminant D65.

Color	Chromaticity Coordinates								Daytime Luminance Factor (Y)	
	1		2		3		4		Min.	Max.
	x	y	x	y	x	y	x	y		
White	0.303	0.287	0.368	0.353	0.340	0.380	0.274	0.316	42	--
Yellow	0.498	0.412	0.557	0.442	0.479	0.520	0.438	0.472	27.0	45.0
Orange	0.550	0.360	0.630	0.370	0.581	0.418	0.516	0.394	17.0	30.0
Red	0.613	0.297	0.708	0.292	0.636	0.364	0.558	0.352	4.0	12.0

**2.3 Retroreflectance.** Sheeting to be visible at night on both straight-away road sections where the barrier is parallel to the roadway and on curved road sections where the barrier can be nearly perpendicular to the path of approach. Follow the ASTM E 810 guidelines for photometric measurement of retroreflective materials should be followed.

**2.3.1**  $R_L$  specification (applicable to straight road sections where the barrier delineation sheeting is parallel to the vehicle travel path). ASTM E 809 Section 6.4 describes this measurement as the “*coefficient of retroreflected luminance* (also called *specific luminance*) – it considers the retroreflector as a surface source whose projected area is visible as an area at the observation position.” The coefficient of retroreflected luminance is given in units of millicandelas per square meter per lux ( $\text{mcd}/\text{m}^2/\text{lx}$ ).

Observation Angle	Entrance Angle	Typical Initial $R_L$ ( $\text{mcd}/\text{lx}/\text{m}^2$ )			
		White	Yellow	Orange	Red
0.2	89.0	8,000	5,000	3,500	1,800
0.5	88.0	5,000	3,000	2,000	1,000

**2.3.2**  $R_A$  Specification (applicable to curves, and approaches to curves) ASTM E 809, Section 6.1 indicates that “*the coefficient of retroreflection* – is usually used to specify the performance of retroreflective sheeting, it considers the retroreflector as an apparent point source whose retroreflected luminous intensity is dependent on the area of the retroreflective surface involved.” The  $R_A$  measurement is typically used for standard sign and work zone device specifications. The coefficient of retroreflection is given in units of candelas per lux per square meter ( $\text{cd}/\text{lx}/\text{m}^2$ ). For a roadway scene where a concrete barrier is used as an appurtenance or to separate traffic in a curve, the following entrance and observation calculations can be shown to apply in curve situations where the barrier is viewed through a range of entrance angles.

Observation Angle	Entrance Angle	Typical Initial $R_A$ ( $\text{cd}/\text{lx}/\text{m}^2$ )			
		White	Yellow	Orange	Red
0.2	20.0	70	50	30	20
0.5	55.0	20	9	7	4
1.0	75.0	1.0	0.8	0.5	0.3

**2.4 Roadway Presence (Linearity).** The sheeting shall be applied as a continuous, uninterrupted line. The material shall provide daytime and nighttime delineation of concrete barrier. The alternating pattern shall provide enhanced contour perception of changes in roadway geometry.

**2.5 Adhesive and Protective Liner.** The pre-coated adhesive shall form a bond to the concrete barrier when applied with the manufacturer’s recommended surface preparation (including the application of a surface preparation adhesive) and tamping instructions.

The protective liner attached to the adhesive shall be removed by peeling without soaking in water or other solvents.

**2.6 Shelf Life.** Sheeting to be suitable for use for a minimum of 1 year after the date of receipt when stored in accordance with the manufacturer's instructions.

**3. DEPARTMENT APPROVAL**

For each color, the manufacturer shall submit a 2700 mm (108") full-width length of sheeting and a Product Evaluation Qualification (PEQ) form to the Materials and Testing Division, Bureau of Construction and Materials, Pennsylvania Department of Transportation, 1118 State Street, Harrisburg, Pennsylvania 17120. If the manufacturer does not have a current quality control plan on file with the Materials and Testing Division, a plan is also required.

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