

Proposed Wording for Standard on use of Retroreflective Materials on Bicycle Helmets:

3. Terminology

- 3.1 The terms and definitions in Terminology E284 apply to this practice/test method.
- 3.2 Definitions:
- 3.2.1 *coefficient of retroreflection, R_A , n --of a plane reflecting surface*, the ratio of the coefficient of luminous intensity (R_I) of a plane retroreflecting surface to its area (A), expressed in candelas per lux per square metre ($\text{cd}\cdot\text{lx}^{-1}\cdot\text{m}^{-2}$). $R_A = (R_I/A)$.
- 3.2.2 *entrance angle, β , n --in retroreflection*, angle between the illumination axis and the retroreflector axis
- 3.2.3 *observation angle, n --angle between the axes of the incident beam and the observed (reflected) beam, (in retroreflection, α , angle between the illumination axis and the observation axis).*
- 3.2.4 *orientation sensitive, adj--materials having coefficients of retroreflection that differ by more than 15% when measured at the two rotation angles $\epsilon_1 = 0^\circ$ and $\epsilon_2 = 90^\circ$.*
- 3.2.5 *retroreflection, n --reflection in which the reflected rays are preferentially returned in directions close to the opposite of the direction of the incident rays, this property being maintained over wide variations of the direction of the incident rays.*
- 3.2.6 *retroreflectivity, n --property of a material or device in which, when directionally irradiated, the reflected rays are preferentially returned in directions close to the opposite of the direction of the incident rays, this property being maintained over wide variations in the direction of the incident rays.*
- 3.2.7 *rotation angle, ϵ , n --angle indicating the orientation of the specimen when it is rotated about a selected axis fixed in it (for plane specimens, usually the specimen normal); in retroreflection, angle indicating the orientation of the specimen when it is rotated about the retroreflector axis.*

DISCUSSION--The rotation angle is the dihedral angle from the half-plane originating on the retroreflector axis and containing the positive part of the second axis to the half plane originating on the retroreflector axis and containing the datum mark. Range: $-180^\circ \leq \epsilon \leq 180^\circ$

Section 000 Retroreflectivity

- 000.1 The surface of each helmet shall have a minimum retroreflective area which is equal to or greater than the surface area of an 8mm band around the largest horizontal circumference of the helmet. (See Fig. 1) This requirement can be satisfied by tape or another material which meets the area, coefficient of retroreflection, and location requirements described in this standard.

NOTE: Retroreflective material on the helmet is one component of enhanced visibility and should be used in conjunction with other visibility enhancements such as the CPSC reflectors on the bicycle, or retroreflective clothing.

- 000.2 The retroreflectivity shall comply with the requirements of Table 1 (below). Materials which are orientation sensitive, as defined above, shall be handled as follows: the material must comply with the minimum requirements for the

coefficient of retroreflection stated in Table 1 at one of the two rotation angles (0° or 90°), and shall be at least 75% of the value stated in Table 1 at the other rotation angle.

000.3 Material used should be certified by the manufacturer to meet the required level of retroreflectivity. The manufacturer's certification should be third party certified by an approved certification organization which is not owned or controlled by manufacturers or vendors of the product being certified. The certification organization shall be primarily engaged in certification work and shall not have a monetary interest in the product's ultimate profitability. Additionally, retroreflectivity may be tested to confirm the manufacturer's certification using ASTM E809 Standard Practice for Measuring Photometric Characteristics of Retroreflectors and ASTM E810 Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting.

000.4 Material shall be located on the helmet to pass the following test: Place the helmet on the reference headform. Turn the headform 360° in the horizontal plane while observing from a single point on the level of the reference plane at a distance of 1 meter from the center of the headform. Some part of the retroreflective surface on the helmet must be visible throughout the 360° turn.

000.5 Material used shall be designed to last the life of the helmet in normal use.

Figure 1:

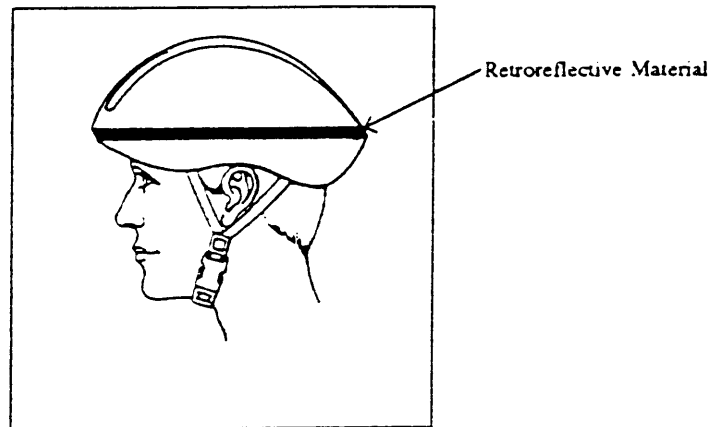


Table 1:

Minimum Coefficient of Retroreflection in $cd/(lx \cdot m^2)$				
Observation Angle	Entrance Angle			
	5°	20°	30°	40°
0.2°	330	290	180	65
0.33°	250	200	170	60
1°	25	15	12	10
1.5°	10	7	5	4